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THE INTERNATIONAL ASTRONOMICAL UNION AT CAMBRIDGE.

By E. W. BROWN.

The meeting of the Union at Cambridge, England, this summer was considered by all those present as one of the most successful ever held, both from the point of view of the astronomical work which was done there and for the manner in which the University had provided for the entertainment of those who took part in the meeting. During a full week scarcely any gap occurred in a constant succession of meetings, entertainments, excursions, and other functions which had been arranged by the general and local committees of the Union. The mornings and early afternoons were given up to the various committees or general meetings of the Union, afternoon tea breaking each day into two parts, the second of which was equally fully occupied by those who wished to take advantage of the opportunities offered.

This Union is perhaps unique amongst similar organizations in the fact that its work is almost entirely devoted to organization designed to advance the interests of the subject. No papers are read and no lectures given. Its main work is done by some thirty committees, each of which is formed to discuss some particular branch of the subject and to formulate plans by which it can be best advanced. The work of the past three years is in general summarized by reports which are printed or lithographed and circulated well in advance of the meeting, so that the committees may spend most of their time on plans for the future or in trying to find a common ground of agreement on the questions in which difference of opinion has developed. These plans, so far as they concern the Union, are those in which international coöperation can be helpful, though this fact is frequently forgotten by the delegates, the habits induced by national and local meetings being apparently too settled to be easily overcome. Where the questions are of wider interest they are discussed before a general assembly of the Union, and of course the general business and organization of the Union is settled at such general assemblies. Quite as important, however, is the unofficial side of the Congress in which astronomers from distant countries may make new contacts and exchange ideas freely. An attempt to summarize the work of these committees, most of which held meetings and some of which had several sessions, is a task beyond the writer of this article. Fortunately it is not necessary, since a full printed account of the meeting will appear in a few months, and from this a summary can

be made which will not only have official sanction but be independent of the views of a single individual. There were, however, some matters discussed which are of general interest and of which it may be interesting to give some brief account.

The United States had a large delegation which included Messrs. Babcock, Boss, Brown, W. W. Campbell, Duncan, Green, Leuschner, Luyten, Mitchell, Olcott, Pollock, St. John, Schlesinger, Shapley, Slocum, Stebbins, van Maanen, and Misses Cannon, Lamson, and Payne, some of whom brought wives and sons and daughters. The expense of ocean travel has increased so much since the war that some of them took this opportunity to make a more or less extended tour of England and on the Continent. Dr. Campbell, the presiding officer of the organization, and Dr. St. John had previously attended the meeting of the International Research Council at Brussels as representatives of the United States. Dr. Schlesinger landed the day before the meeting from South Africa, but the majority had travelled across the Atlantic at their own times, finding the official passports which they carried a saving of both worry and expense. For once England treated us to sunny days and warm weather after a quite cold spell some two weeks earlier. Those who remember the Mathematical Congress in Cambridge in 1912 will recall a week of almost continuous rain of a semi-tropical character which was ascribed to the dust caused by the eruption of the volcano Katmai. This summer no such outburst occurred to produce bad weather, a fortunate circumstance, since there were a number of garden parties and outdoor receptions which would have lost much of their charm if the shelter of a building had had to be sought. At this season of the year a large proportion of the faculty of the University is in residence, as well as those students who are working in the graduate departments. Of the undergraduates somewhat less than half spend some six weeks of the summer in Cambridge working for honors in the various schools.

The arrangements as usual in England were carried out with much detail and had that elastic quality which permitted changes to be made without bringing the general scheme to grief. Committee rooms were assigned to the various sections as they were needed, all the work being carried on in a single building conveniently located for the purpose. It was, however, somewhat strange to be forbidden to smoke anywhere but in the reception room, a prohibition which the solitary man in charge had considerable difficulty in enforcing, owing to the forgetful habits of many of the visitors. As a result the committee work was carried out in comparatively pure air.

The Congress opened with an assembly in the Senate House of the University which was attended by the Chancellor, Lord Balfour, and at which a certain number of formal speeches were made. We afterwards adjourned to Downing College where the Vice-Chancellor, who is the responsible head of the University, entertained us in the beautiful grounds which surround the Master's Lodge. Business started the

next morning. That afternoon and the succeeding days we had a delightful garden party at the Observatory, given by Professor and Mrs. Newall and Professor and Miss Eddington. The evenings were taken up by receptions held in the gardens and halls of St. John's, Sidney Sussex, and Queen's Colleges. These were memorable from their situations in the beautiful grounds surrounding the Colleges, with the twilight gradually fading and the rows of Japanese lanterns and ground lights dotting what Rudyard Kipling called their "mint-sauce" lawns. The last night we learned what a college "feast" is like through the hospitality of the Master and Fellow of Trinity College. They had also provided us with some distraction on the previous Sunday evening, when Dr. Alan Gray gave an organ recital in the college chapel.

A colorful function took place on July 31 at which honorary degrees were conferred. Many Doctors of Science, Letters, and other subjects, arrayed in their scarlet robes, marched in procession from the library portico to the Senate House, where the Vice-Chancellor sat in his chair of state supported by the proctors and other officials of the University. As each candidate was brought before him the Public Orator delivered a Latin oration setting forth the eminence of the candidate, and an occasional smile or look of intelligence was visible even amongst the visiting astronomers. The venerable Baillaud, of Paris, deSitter, of Holland, the new President of the Union, Nagaoko, of Japan, and two of our own delegates, Campbell and Schlesinger, in turn received the degree of Doctor of Science from the University, an honor which few astronomers fail to appreciate from a University which has furnished so many men to advance the subject from the time of Isaac Newton to the present day. Just previous to the ceremony the Vice-Chancellor had again entertained many of us at lunch in the hall of Downing College to which ladies were also invited.

The Scientific Instrument Company on two afternoons found many interested visitors at its factory where Sir Horace Darwin entertained them at tea. An excursion was also made to Ely to see the old cathedral which has stood in the Fenland for so many hundreds of years. It is situated on the only elevated ground for many miles in every direction and in earlier days was the refuge from the floods which not infrequently covered the Fen, as the name of "Isle of Ely" still testifies. An opportunity was afforded one afternoon for those who had brought slides to exhibit them, and an interesting hour was spent in seeing the results of some of the latest developments in the photographic art as applied to astronomy. Finally, the big hall of the Botany School was crowded one evening to hear brief talks by the Master of Trinity, Sir J. J. Thomson, on the structure of light, and by Professor Eddington who gave an account of some of the latest work, largely his own, on the internal constitution of the stars.

The interests of the ladies were taken care of by a committee having at its head Lady Darwin, the widow of Sir George Darwin, which made arrangements for them to see and hear about the many interesting

features of the town and University. Most of them also attended an informal evening reception at Lady Darwin's house, which has a beautiful situation on the River Cam, the picturesque garden on both sides of the river being lighted up so that its beauties could be seen. Altogether, the hospitality and thoughtfulness of our hosts and hostesses for the comfort and amusement of their numerous guests are an experience which few of us will forget. As one prominent member remarked, "Cambridge has set a precedent which will make it difficult for the hosts of future meetings to follow."

Although the numerous functions occupied the afternoons and evenings, astronomers were hard at work earlier in the day. The committee meetings were well attended throughout not only by their members but by other delegates. One of the questions to be settled was that of the beginning of the Julian Day, and as several committees seemed to be interested in this, a special meeting was arranged to discuss it. The final result, which was endorsed at a general meeting of the Union, seemed to be rather a collapse of the movement for a change, as the Union voted with very few dissentients to retain the old reckoning which begins at midday. Another question, namely, the letters by which Greenwich Mean Time as reckoned from midnight should be known, was left in the air since no general agreement could be obtained. It is doubtful if either of these results of the Congress is quite satisfactory in view of the decided actions taken some time ago by American astronomers. But few changes were made in the organization. The Committee on Relativity was dropped since the subject seemed not to need international coöperation. Two new committees, one on Solar Parallax, with a view to the Eros Campaign which is to be undertaken in 1931, and the other on Stellar Statistics, were instituted. The word "delegate" was more clearly defined so that it might be fully understood that any country was at liberty to send as many delegates as it wished, though the voting power remains the same as at present.

The incoming President of the Congress is Professor deSitter, replacing Dr. Campbell who, though elected for six years, felt that both on personal and general grounds it was advisable for him to retire at the present time. Professor Fowler, who has been the General Secretary of the Union since its foundation, has, to the regret of all, found it necessary to give up the somewhat heavy burden and has been succeeded by Lieutenant-Colonel F. J. M. Stratton, whose many qualifications fit him well for the task. The two outgoing Vice-Presidents are replaced by Professors Schlesinger and Eddington. Finally, an invitation to meet in Holland for the next Congress was enthusiastically accepted by the Union.

Mention must be made of the question of the admission of the former enemy nations to the Union. Under the rules of the International Research Council the Union has no power to take any action one way or the other. At the meeting in Brussels of the International Research

Council the previous week no change had been made in the rules although the matter had been extensively discussed. During the week at Cambridge much private discussion had occurred and as a result steps have been taken which it is hoped will lead to a new meeting of the Council within a short time at which a full vote of the various adhering countries can be obtained either by delegates or through the mails. Many of us felt that the opinions of the Astronomical Union should receive some public expression and arrangements were made that at the last session of the Union opportunity should be afforded to the various delegates to express their views. Nearly all of them made statements which may be roughly divided into two groups of which one favored admission unconditionally and immediately and the other as soon as the countries in question had joined the League of Nations, the American delegation being in the former group.

At the close of the meeting most of those present adjourned to London to share in the celebration of the 250th anniversary of the founding of Greenwich Observatory. The principal function took place on the afternoon of July 23 at the Observatory, where a garden party was given by the Astronomer Royal and Lady Dyson and was attended by the King and Queen to whom a few of the overseas representatives were presented. The costumes adopted for the occasion were varied: full evening dress, many silk hats and cutaway coats, straw hats and light morning suits were all to be seen among the four hundred invited guests in the limited space which the grounds of the Observatory occupy. Although the day threatened rain the route of the royal party through South London and Greenwich Park right up to the Observatory was lined with people, but the astronomer was not challenged to show his ticket until he reached the great gate of the Observatory—a testimony to the discrimination of the London police force. In the evening a reception was given by the Royal Society at its rooms in Burlington House.

The next day some of us were invited to a luncheon given by the Government at the Savoy Hotel and presided over by the First Lord of the Admiralty. In the assembly room a plentiful supply of cocktails showed that the former American spirit has found a resting place in England where European habits still prevail at the tables. After coffee had been served we learned a number of interesting facts, amongst which were the experiences of the First Lord that morning in acting as a mediator for the settlement of the coal strike, and the information that Charles the Second was not so bad as he had been painted, since he seemed to have been the only English monarch who had really tried to do something for science. But that scientific ideas are permeating the highest circles is shown by the opening of the new observatory at Johannesburg by the Prince of Wales and also by his acceptance of election as President of the British Association for the Advancement of Science which meets at Oxford next year.

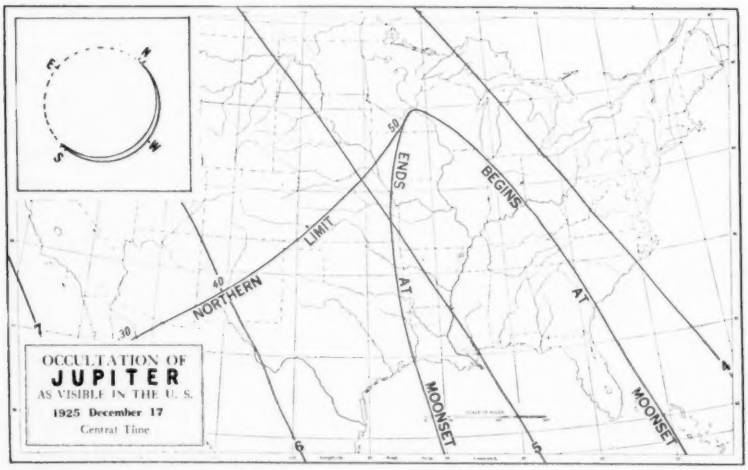
The final touch to the double occasion was staged by the Royal

Astronomical Society and was calculated to bring back the astronomers to their usual habits. A meeting was held in the historic rooms of the Society at Burlington House, at which some eight of the visitors were invited to talk briefly about their own work. Some discussion followed in each case, but for this I shall refer the reader to the pages of the *Observatory* which gives a full account of the meeting in its accustomed attractive manner. The numerous American readers of the "Oxford Notebook" in that journal have already seen Professor Turner's picturesque account of the various incidents which took place both in Cambridge and in London, and I cannot do better in closing than to refer to this also.

OCCULTATION OF JUPITER OF 1925 DECEMBER 17.

By WILLIAM F. RIGGE.

The occultation of Jupiter of 1925 December 17 will occur under very adverse circumstances. Very few of the states will get a glimpse of it, and even for them the moon will be almost on the horizon. To this must be added the narrowness of the moon's crescent, which is only 2.2 days old and has a maximum width of only one-tenth of a lunar diameter. The stellar magnitude of Jupiter is —1.5.



On account of these many untoward circumstances it was practically impossible to sketch more than a general outline of the occultation on the annexed map. The labelled curves are probably sufficiently intelligible. Between those marked "Begins at Moonset" and "Ends at Moonset" the planet sets occulted. West of this latter curve both the immersion and emerion are visible, while the places north and west of

the limit line, and north and east of the one "Begins at Moonset," must be content with a close conjunction. The numbers 30, 40, 50, on the Northern Limit denote the minutes after 6 P. M., Central Time, of the grazing contact. The lines marked 4, 5, 6, 7, indicate the Central Times of sunset.

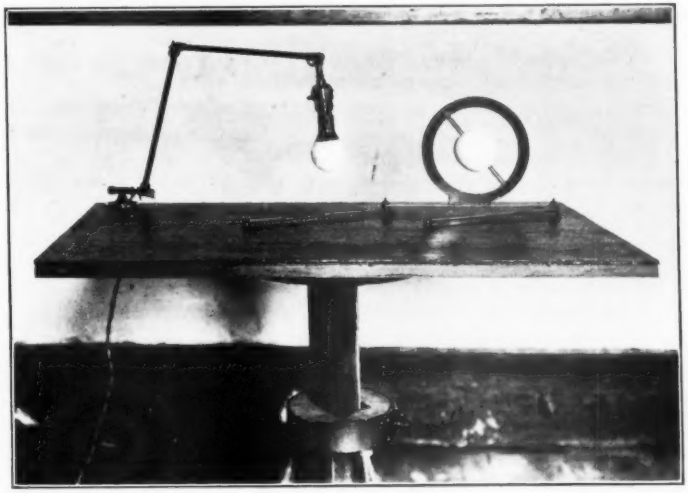
Two days later, on the 19th, there will be a tolerably close conjunction of Venus (mag. —4.3) and the moon under nearly the very same circumstances. In both cases the planets will be above the moon.

A NEW PIECE OF DEMONSTRATION APPARATUS FOR DESCRIPTIVE ASTRONOMY CLASSES.

By DINSMORE ALTER.

In POPULAR ASTRONOMY of April, 1922, were published descriptions and photographs of several pieces of apparatus, used to aid visualization of some of the more difficult parts of a first course in astronomy.

For some time I have realized the need of a piece to show correctly the effect of the obliquity of the ecliptic in causing seasons, variations in length of day and climatic zones on the earth. At first the only plans which presented themselves involved rather intricate gearing and too great expense.



Recently the idea of the simple parallelogram, as illustrated, was used and found to be practical. It is almost needless to remark that accurate construction of the parallelogram is essential.

The photograph is almost self-explanatory. The bearings in the table are tapers of steel in brass. The earth is carefully mounted to avoid friction and will spin for several minutes. The frame holding it can be shifted in its clamps, permitting the effect of any obliquity from zero to ninety degrees to be shown.

The apparatus has now been used for two classes and the results seem to be more satisfactory than anticipated. The darkening of the room, save for the light of the "sun" in the apparatus, creates a dramatic interest that holds the students' attention while the instructor explains zones, climates, the effects of different obliquities upon man, etc., etc. Previously for the majority of students these were poorly visualized and as a result were dull.

There must be many instructors with pieces of demonstration apparatus which would aid the rest of us. Rumor tells me that Harvard, for instance, has many such. Cannot descriptions and photographs of these be published for the benefit of all?

University of Kansas, February 19, 1925.

REPORT ON MARS, NO. 31.

By WILLIAM H. PICKERING.

Formation and Melting of the Polar Caps.

Since the Jamaica Observatory was established in 1912 we have observed the planet Mars through six apparitions with the Draper 11-inch refractor. As this instrument has now been returned to Harvard, at their request, the present seems a suitable occasion to summarize some of our results with it, rather than awaiting the next apparition, when we hope, by means of another telescope, that we shall be able to complete our observations for the whole of the planet's orbit and year.

The seasonal variation in the size of the polar caps, first noted by Sir William Herschel, is the most obvious change occurring upon Mars, and we shall devote a large part of the present Report to a discussion ot this phenomenon. We may in general remark that prior to the equinoxes the polar regions of the planet are shrouded in yellowish white cloud, no brighter than that which is frequently seen upon the limb. At about the time that the vernal equinox is reached this cloud rapidly clears away, exposing the dazzling white snows beneath it to our view. The snow cap is then of nearly its maximum size, and after sometimes a light increase, rapidly diminishes with the approach of the summer solstice.

Table I contains our measures of the two caps. These measures are based exclusively upon drawings. This is the only satisfactory method of measuring planetary detail, since micrometer measures of small

bright areas always contain a large systematic error, varying from 0″.20 to 0″.30, dependent upon which of the two methods of measurement is adopted. This fact has been determined by means of measures of remote artificial disks (*H. A.* **32**, 133). Only a comparatively few drawings at each apparition were measured, but these were selected as giving characteristic and representative values. The table is divided into sections, each section being headed by the year in which the corresponding opposition took place. Under several of the sections the first line contains the word "cloud." The corresponding entry in

TABLE I.

MELTING OF THE POLAR CAPS.

NORTHERN CAP					*SOUTHERN CAP*				
Miles	Mars	Date	☉	M. D.	Miles	Mars	Date	☉	M. D.
		1914					**1920**		
Cloud	8″.4	'13 Sept. 30	328°.2	Jan. 53	Cloud	9″.2	'20 Feb. 14	92°.8	June 23
2400	13.1	'13 Nov. 30	359.8	Feb. 55	1300	13.2	'20 June 6	146.1	Aug. 31
2000	14.2	'13 Dec. 12	5.6	Mar. 12	2000	10.4	'20 July 9	163.5	Sept. 7
1500	14.4	'14 Jan. 15	21.8	Mar. 45	1500	8.0	'20 Aug. 24	189.5	Sept. 52
900	12.0	'14 Feb. 8	32.8	Apr. 12	1300	4.6	'21 Jan. 28	287.0	Dec. 39
1500	11.6	'14 Feb. 12	34.6	Apr 16					
1500	5.0	'14 June 8	85.6	June 17			**1922**		
		1916			2000	14″.5	'22 Apr. 29	149°.0	Aug. 36
Cloud	5.3	'15 Aug. 27	332°.9	Feb. 5	2500	15.1	'22 May 3	151.0	Aug. 40
2500	5.8	'15 Sept. 22	346.6	Feb. 31	2800	18.6	'22 May 25	162.6	Sept. 5
2400	7.2	'15 Nov. 4	8.2	Mar. 17	2500	19.9	'22 June 5	168.5	Sept. 16
2000	8.5	'15 Nov. 27	19.2	Mar. 40	2000	19.5	'22 July 6	186.1	Sept. 46
1500	10.9	'15 Dec. 25	31.9	Apr. 11	1500	13.8	'22 Aug. 22	214.2	Oct. 35
1000	11.3	'16 Mar. 19	69.3	May 37	2000	11.6	'22 Sept. 14	228.6	Nov. 3
500	9.6	'16 Apr. 6	77.1	May 55	1000	11.5	'22 Sept. 15	229.2	Nov. 4
650	7.8	'16 May 3	89.0	June 25	700	7.0	'22 Dec. 6	280.9	Dec. 29
					1600	6.0	'23 Jan. 6	299.6	Jan. 4
		1918					**1924**		
1900	4″.5	'17 Sept. 4	359°.5	Feb. 56	Cloud	8″.3	'24 Apr. 10	162°.2	Sept. 5
2100	4.8	'17 Sept. 29	12.0	Mar. 23	2600	8.6	'24 Apr. 15	164.8	Sept. 9
2000	5.0	'17 Oct. 10	17.1	Mar. 35	2900	9.7	'24 Apr. 29	172.6	Sept. 23
1500	7.0	'17 Dec. 11	45.3	Apr. 40	2700	10.6	'24 May 10	178.8	Sept. 34
1000	10.8	'18 Feb. 1	68.1	May 34	2300	11.1	'24 May 14	181.1	Sept. 38
500	12.6	'18 Feb. 18	75.5	May 51	2000	11.7	'24 May 21	185.1	Sept. 44
850	13.5	'18 Mar. 1	80.4	June 6	2100	18.3	'24 July 5	212.1	Oct. 31
500	13.8	'18 Mar. 5	82.1	June 10	1500	20.8	'24 July 18	220.0	Oct. 45
300	7.2	'18 July 4	138.0	Aug. 15	1000	24.9	'24 Aug. 28	245.7	Nov. 29
0	7.0	'18 July 8	140.1	Aug. 19	500	18.8	'24 Oct. 5	269.7	Dec. 11
700	6.9	'18 July 10	141.1	Aug. 21	250	14.6	'24 Oct. 29	284.6	Dec. 35
1400	6.7	'18 July 18	145.1	Aug. 29	400	12.0	'24 Nov. 18	296.7	Dec. 54
1000	6.1	'18 July 20	146.1	Aug. 31	150	10.7	'24 Nov. 30	303.8	Jan. 11
					300	9.7	'24 Dec. 11	310.2	Jan. 22
		1920			Cloud	6.9	'25 Jan. 23	334.1	Feb. 7
1600	4″.5	'19 Oct. 23	42°.7	Apr. 34					
1500	5.0	'19 Nov. 19	54.6	May 4					
1000	6.2	'19 Dec. 26	70.8	May 40					
800	10.7	'20 Feb. 29	98.5	June 45					
400	11.1	'20 Mar. 4	101.3	June 51					
800	12.4	'20 Mar. 15	105.3	July 6					
500	13.0	'20 Mar. 20	108.5	July 11					
0	13.3	'20 June 5	145.6	Aug. 30					
400	13.2	'20 June 6	146.1	Aug. 31					
400	11.8	'20 June 21	153.9	Aug. 45					
Cloud	6.2	'20 Oct. 26	228.0	Nov. 2					

the third column indicates the earliest date on which a distinct cloud was recorded at the pole in question. The next line refers to the first date on which snow was clearly visible. The first column in the table then gives the diameter of the polar cap in miles, the second the apparent diameter of the planet, the third the terrestrial date of the observation, the fourth the solar longitude, and the last the corresponding Martian Date.

The results given in this table are represented graphically in Figure 1, where the abscissas give the solar longitudes. That is to say they represent time, 360° to the Martian year. The location of the vernal and autumnal equinoxes, and of the summer and winter solstices for each hemisphere are indicated by their initials at the bottom of the graph. The ordinates give the diameters of the snow caps in miles. When these are very small they may have been cloud in some cases, but the diameters of what was recognized as certainly cloud were not plotted. For this reason each of the two dotted curves extends through only half a Martian year. The numbers indicate the year of the opposition of the full lines, but not necessarily the year in which the observation was made. The dotted lines give what is believed to be a mean result. The left hand curve refers to the northern cap, and the right hand one to the southern. The northern cap reaches its minimum about the middle of the Martian August, and the southern one early in January, as is indicated by the terminations of the two dotted lines.

Both caps may disappear entirely, but in any case they very soon reform, and rapidly increase in size, varying their dimensions and shapes from night to night in a striking maner, such as can only be due to cloud. Sometimes the cloud forms before the cap disappears, in which event the latter never reaches a very small size, although it may later be seen to have vanished. Such was the case in 1914, 1920, and 1922, as indicated in the figure. For several Martian months following the disappearance of the snow, these clouds shift about and sometimes disappear, exposing the polar regions beneath them. Later in the season, after the winter solstice, this clearance apparently always takes place for a few weeks. After that the clouds reform, and the steady deposition of the polar cap begins. This fact proves that the caps are really snow, and not hoar frost, as some observers formerly thought. We thus see that twice a year, about midway between each solstice and the following equinox, both polar regions always become clouded.

This is indicated for the northern hemisphere by the inclined sharply rising dotted line at the extreme left of the figure. Following along towards the right, we note that from the vernal equinox until midway between it and the summer solstice the snow is visible, and the corresponding pole is therefore always clear. It is often clear much longer, in which case as we have said the cap sometimes may disappear, but heavy clouds of rapidly varying size and shape will presently certainly form. These probably originate from moisture evaporated from the northern hemisphere, and condensed by the gradually falling

temperature. Our curve stops here, but following along in the figure, through the autumnal equinox of the northern hemisphere, and between it and the winter solstice, clear spells of a few days duration occur. These grow longer and more frequent as the solstice is approached. The polar regions are then bright, and are frequently described as "greenish, brightness 8." This would imply that these regions were as bright as the limb clouds, but differed from them in color. Possibly small green areas, too small to be separately distinguished, are seen between small scattered clouds. As we approach the winter solstice the polar regions for orbital reasons can only be observed under unfavorable circumstances, as will be shown in more detail presently. The clearance after the winter solstice for the same reasons is also never well seen. Heavy clouds derived from the melting of the southern polar cap now appear at the north, and this completes the planet's year for the northern hemisphere, bringing us back to our starting point.

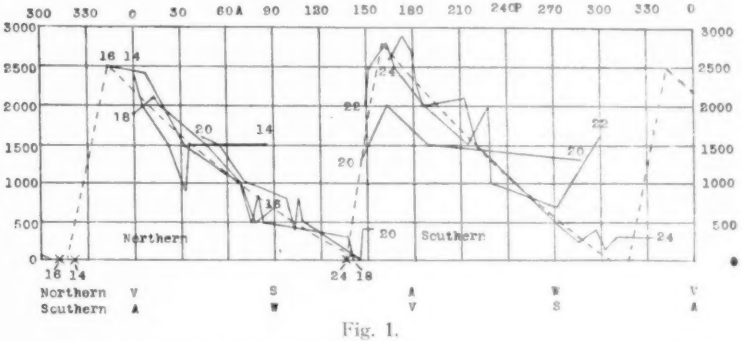


Fig. 1.

The polar regions have much more cloudy weather in the daytime than any other portion of the planet, and it is probable that no daytime precipitation such as rain occurs elsewhere. On the line of the zero ordinate in the figure the three crosses indicate the last date in each of the corresponding years when the pole appeared to be wholly free of both snow and cloud. In 1918 and 1920 the planet was too remote at the proper season to observe the northern pole with regard to this question, and in 1922 and 1924 the northern pole was turned away from us. In 1914 and 1916 the planet was too remote to observe the southern pole, and in 1918 and 1920 this pole was turned away from us. In 1922, which would have been a favorable year for this particular observation, the writer was away from the observatory, and did not get back until the snow had already appeared. The crosses indicate that in these three years the two cloudy spells began just about 180° apart. The northern pole was free from cloud until ☉ 315°, M. D. January 30, and the southern one until ☉ 135°, M. D. August 10.

The northern pole thus received its water supply some five weeks earlier in its year than the southern one. At the top of the figure the

A and P indicate the location of the aphelion and perihelion of the planet's orbit. We can thus see one reason why the southern cap melts more quickly than the northern one, and why the moisture for the northern cloud cap therefore arrives somewhat earlier in its winter. The northern cap tends to disappear at about ⊙ 145°, M. D. August 29, and the southern one at ⊙ 305°, M. D. January 13. This indicates that the northern cap has melted ten weeks later in its year than the southern one.

When the planet is near us at opposition we can readily observe it while the two hemispheres are having their spring, summer, and autumn, but the hemisphere having its winter is always turned away from us. It is therefore only when the planet is remote, that these particular winter observatoins can be made. In point of fact when those indicated by the three crosses were secured the planet's diameter was 7″.8, 4″.8, and 6″.0 respectively. With good seeing, however, the observations are not difficult, and it appears evident that no snow is permanently deposited on one pole until all, or nearly all, of that on the other has melted. When both poles are bright at the same time, one or the other of the bright regions is due to cloud. It may be remarked that no region in high latitudes can ever be well seen within one month of its winter solstice. This is partly due to its position at the time with regard to the earth, and partly to the fact that the regions within the polar circles themselves are almost completely shrouded in night during this interval.

It now appears certain that there is no permanent deposit of snow at either pole until well past the winter solstice. This obviously cannot be on account of an assumed high temperature of the polar regions, but simply because there is no moisture there to deposit as snow. Each cap must wait on the melting of the other, and the transference of the moisture across the planet. As a result, we find that the formation of each snow cap under the clouds is very rapid, while its melting is very much slower.

From an examination of the dotted lines we conclude that the northern cap reaches its maximum size at about ⊙ 343°, February 24, after an interval of 28° or 50 Martian days from the time it began to form. Similarly the southern cap reaches its maximum at about ⊙ 160°, September 1, after an interval of 25° or 47 days. The northern cap is believed to be completely melted after an interval of 162°, or 341 Martian days, and the southern one after an interval of 146°, or 235 days, the eccentricity of the orbit accounting for the fact that the number of days is not proportional to the number of degrees. We therefore see by the Figure, not only that the southern cap is larger than the northern one, but that it melts more quickly. Indeed, the northern cap requires nearly half as long again to melt as the southern one, the ratio of the number of days being 1.451. The natural explanation of this fact would be that the northern cap is melting at the time of the aphelion of the planet, and the southern one at the perihelion. This in fact is

the explanation that has heretofore been given for the phenomenon. If we express the matter quantitatively however, we shall find that this explanation is wholly inadequate. The mean distance of the sun from the planet when the northern cap is melting is 145 million miles, and its distance when the southern cap melts is 138 million. Squaring these numbers we obtain a ratio of only 1.104. The explanation is undoubtedly correct as far as it goes, but it only explains one-quarter of the observed ratio of the days of melting.

Looking further into the matter, we may assume that all the moisture coming from the northern cap not used for vegetation goes to form the southern one, and *vice versa*. As this moisture is spread out in the form of snow to cover an area 2900 miles in diameter for the southern cap, instead of only 2500 for the northern, it will melt quicker in the ratio of the squares of these numbers. This ratio is 1.346. Combining this with our previous ratio, caused by the difference in distance from the sun, we obtain 1.486, which agrees closely with the ratio of the number of days, 1.451. In other words, if we accept the fact that the southern cap melts in 235 days, we should then naturally expect the northern one to require 349 days, which is in fair agreement with the observed interval of 341 days.

Detailed Observations of the Polar Caps.

Following the description in the Table, we see that in 1913 the northern cloud cap was first clearly distinguished on September 30, diameter of the planet being 8″.4. It may have existed before that, but not before September 13, ⊙ 318°.7, indicated by the cross in the Figure, when the polar regions were last seen to be clear of cloud. The pole itself was not visible, however, since the Martian latitude of the sun was —15°.5. The clouds did not clear away exposing the cap until November 30, when the latter was shown at its maximum diameter for that year of 2400 miles. The corresponding Martian date was February 55, the end of their winter. The diameter of the cap first fell to 2000 miles on the Martian date of March 12, but fluctuated in size until M. D. March 45, much as our own does in the early spring, sometimes exceeding 2000 miles, but dropping on that date to 1500. From then until we ceased observing it on June 8 it continued to vary in size, but did not diminish very greatly (see Figure 1). The explanation of this last seeming anomaly is that the snow was probably covered or replaced by cloud, as we know has occurred at other apparitions. In this case, however, the planet was so remote that it was impossible to distinguish between them. It therefore appears that in this Martian year the northern snow cap, as seen from the earth, never reached a very small size. In nearly all the apparitions the earlier determinations of the size of the cap are a little uncertain, since generally it was necessary to estimate what portion of its extent was cut off by the unilluminated area of the planet next to the terminator.

The apparition of 1916 presented no unusual features. On account

of absence from the observatory, the writer was unable to record the disappearance of the snow cap, or its concealment by cloud, whichever happened to occur. The apparition of 1918 was a rather unusually interesting one. Our first drawing was made on September 4, 1917, and it is stated that the cap was white not yellow, and therefore snow not cloud. After a slight increase, the cap gradually diminished in size, submitting to the customary variations, until it reached 500 miles, on the Martian date of May 51. It then appeared surrounded by a fainter whitish ring. This may have been cloud, and has been observed on previous occasions. It apparently presages an enlargement of the cap. The next night the fainter area had shifted to the sunset side of the cap. Bad terrestrial weather followed, and no more observations could be secured for eight days, but on February 27 and March 1 it was seen, as indicated in the Table, that a very considerable enlargement of the cap had occurred. On March 3 it had greatly diminished, and by March 5 had returned to its former size. The faint whitish marking now reappeared, this time on the sunrise side of the cap. The cap then slowly diminished in size, although not with perfect uniformity, until July 4. It was then only 300 miles in diameter, and had not exceeded 600 miles during the previous 17 weeks, a most unusually long period of fairly uniform size. On July 8 it is recorded that it had disappeared, but the seeing was poor, only 5. The next night it was again visible, and now rapidly increased in size as shown by the Table, submitting however to great fluctuations, such as always occur at this season of the year. This was undoubtedly due to clouds and snow storms, such as were observed to better advantage at the next apparition, and have been already described in Reports Nos. **20** and **23**.

In the apparition of 1920 at the time of our earliest observation, the size of the cap was already reduced to 1600 miles. During February, March, and the first part of April we got comparatively few observations, only fifteen nights in all, in large part due to unfavorable weather. On Mars too the weather was bad, as indicated in the Table by the extensive variations in the size of the northern cap. After Martian July 11, however, the weather there settled down, and no further large fluctuations occurred until August 30, when for one night it is recorded "with seeing 9 the northern cap has certainly gone." It may have been missing the two previous nights, when unfavorable weather prevented observations. The next night, however, it was visible of the usual size, and as a conspicuous object. It remained visible until August 45, after which the expected storms enlarged it greatly and irregularly, rendering any observations of position angle impossible. This was on the whole, however, a favorable year for this purpose, although not equal to the apparition of 1918. The clouds now gradually diminished in size, and the last one was seen on terrestrial October 26, as shown in the Table. The north pole which during the whole apparition had been very favorably placed with regard to us was then turned slightly away, and was concealed by the terminator. Our last

observation was made on January 28, 1921. The diameter of Mars was then 4″.6, and the northern pole was turned away 24°.5. Just when the clouds returned to this region we therefore have no means of knowing. Owing to absence from the observatory our observations in 1922 did not begin until April 29, ⊙ 149°.0, M. D. August 36, diameter 14″.5. The snow cap had then melted, and extensive clouds covered the northern polar regions. Although the pole was located near the limb, these clouds were not always visible, and sometimes were very small. They were nearly always most marked towards the sunrise side of the disk. They reached their maximum size the latter half of Martian September and the first half of October, and frequently projected beyond both the limb and terminator, as recorded in Report No. **29**. When they occasionally cleared away a fresh thin layer of snow could be seen beneath them. That it was snow, not cloud, was proved since on June 30, ⊙ 182°.6, M. D. September 40, two curved canals some 70 miles in width were clearly seen extending northerly from Acidalium for several hundred miles into the cap. Other similar canals were noted in early Martian October. Unlike the cloud cap preceding it, the southern edge of the snow was parallel to the planet's equator. A few days later clouds again covered this region. A couple of months later, in November, these clouds diminished and the snow was found to have disappeared, but in the Martian December the clouds reformed, and probably remained until the vernal equinox. The north pole was then turned away from us, however, so that definite information was unobtainable on this point. The northern cloud cap was frequently seen in 1924, but owing to the unfavorable position of the pole the observations are considered of little value. The inclination will be somewhat more favorable in 1926.

Turning now to the southern polar cap, the extreme southern bright regions Argyre I and II, Dia, Thyle I and II, and Novissima Thyle are believed to be simply temporary clouds. It is often difficult to distinguish between the brighter southern areas and the cloud cap. On November 1, 1913, ⊙ 345°.1, M. D. February 28, the southern cap is described as whitish yellow, and brighter than before. This seems to imply the presence of a cloud cap. Much cloud was evident in the southern hemisphere at the time of the southern autumnal equinox, but five weeks later all cloud had for a few days disappeared. It then reformed and persisted throughout the apparition, being last observed at ⊙ 72°.0, M. D. May 43. In 1915 the cloud cap was observed throughout the Martian March and occasionally later, but as the southern pole was now turned away from us from 15° to 20° the observations were of little value. The same was true throughout 1918 and in the early part of 1920. In the latter apparition the snow appeared on M. D. August 31. Its next appearance, as is shown by the Table, was on September 7, after which it was visible nearly continuously until we ceased observing. Although it was never very large, this is in part accounted for since the pole was turned away from us

over 20° at this time. On the other hand it was never very small, and seems to have retained its size for an unusual period, doubtless due to cloud.

In 1922 the cap fluctuated remarkably in size, and these fluctuations were in all cases confirmed by several independent drawings. The disk was clear of cloud on the first night that we drew it, April 29. It then gradually increased in size to a maximum of 2800 miles. This was larger than the northern cap ever attained, and was fully confirmed by other drawings. An error of 100 miles would be unlikely. It slowly decreased to 1500 miles, gradually returned to 2000, and then in a single day, with nearly the same central meridian, dropped to 1000. Several drawings made on different nights both before and after this drop confirmed it, and also indicated that the cap was composed of snow, not cloud. Its diameter remained in the vicinity of 2000 miles for 10 weeks. The smallest size reached was 700 miles. In 1924 the cap attained an even larger size than in 1922, reaching 2900 miles. As in 1922 it remained at about 2000 miles for a considerable period, 7 weeks. It fluctuated somewhat in size in Martian December and reached its smallest diameter in January, being finally concealed by clouds on Martian February 7. Its actual disappearance has never been recorded here. How strikingly it differed in size, at the same season, from its appearance at the end of 1920 and 1922 is clearly shown by the Figure. Our last observation of the planet was on February 1, 1925. The next day the telescope was dismounted, preparatory to being shipped back to Harvard.

The Temperature of Mars.

In our last Report we discussed this matter, based on the radiometric observations made at the Lowell and Mt. Wilson Observatories, and concluded that their results gave minimum rather than true values of the temperature, especially so near the poles and limb, where the heat rays traversed a very considerable thickness of the Martian atmosphere. The Lowell observers stated that the polar regions gave out practically no planetary radiation, while those at Mt. Wilson concluded that the temperature of these regions was about —90° F. They admitted some doubt, however, as to the accuracy of this observation, but stated that the temperature at the limb must be much lower than +10°. The temperature of the center of the disk they placed at about +45°. With a particularly dense atmosphere on Mars, which would prevent any important lowering of the temperature at night, such a difference strikes us as improbable. However, we know exactly the temperature at the edge of the melting snow cap, which regardless of the pressure of the Martian atmosphere is just 32° F.

Had the thermocouple observations at Flagstaff and at Mt. Wilson indicated this temperature for the polar cap, then we should have concluded, as has been already pointed out by Coblentz (Popular Astronomy, 1925, **33**, 370), that Mars possessed an atmosphere of only slight

density. The fact that the instrumental record indicates a very low temperature on the other hand shows that there is a very considerable amount of material between us and the cap, sufficient to entirely conceal the temperature of the latter, and to give us instead its own true temperature. We thus have still another argument in favor of a dense atmosphere for this planet. Indeed it is conceivable that we might determine its minimum density by assuming that the temperature at the center of its disk was identical with that on the earth in the same latitude, and comparing this temperature with that indicated by the thermocouple. If the temperature on Mars is higher than that on the earth, as now appears probable, the computed density of its atmosphere should be increased.

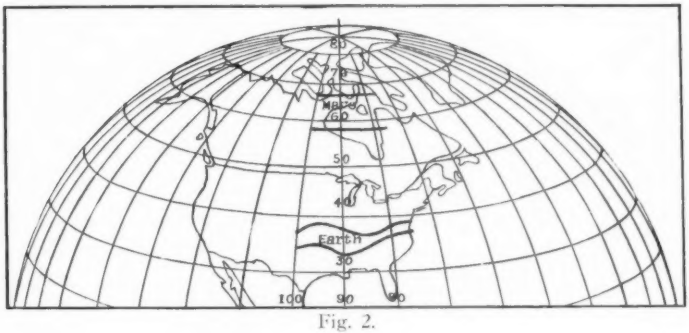


Fig. 2.

Let us now compare the limits of the Martian and terrestrial polar caps. During the winter and early spring months, the Weather Bureau at Washington publishes a chart giving the western and southern limit of snowfall for the United States. We have selected the March and April limits for the five years 1920 to 1924 inclusive, and averaged and plotted them (see Figure 2). The line below the word earth gives the average March limit, and the line above it that for April. It is regrettable that the authorities do not give the May limit, which would surely most of it lie within the boundaries of the United States. We have not carried the lines west of the 100° meridian, which crosses the middle of the Dakotas and Texas, because there the Rocky Mountains carry it far to the south, while the Pacific Coast carries it very far north. Only a small portion of the region east of 100° lies at a greater elevation than 2000 feet, and half of it at less than 1000.

On Mars we do not usually see the northern snow cap before the first of the Martian March, because it is covered by clouds. We have therefore plotted the limits of its polar cap for March and April only upon our map. This we have done by means of the two lines below and above the name of the planet. Owing in part to the fact that its atmosphere is much more extensive than ours, and in part to its smaller snow cap, we see that its climate in a latitude which on the earth would

correspond to that of the northern part of Hudson's Bay, in the spring months of its year is identical in temperature with what we possess at the same season in southern Missouri and Kentucky. Those latitudes upon Mars must be very much warmer still, perhaps not tropical, but certainly not moist. In the eastern hemisphere the two corresponding latitudes are those of the Faroe Islands, half way between Scotland and Iceland and the northern part of Africa. In general we may say that the climate on Mars as we travel from its equator towards the poles must be much more uniform than it is upon the earth. This is further indicated by the bright greens visible in its polar regions during the late autumn months. With a dense protecting atmosphere, even the long arctic night may not be at all unbearable on Mars, and is doubtless distinctly less cold than our own. On the earth the most intelligent portion of the human race lives for a considerable portion of the year well within the limits of the polar cap. Could we be transported to Mars we should probably find the whole of its surface habitable,—a much larger area than is comfortably so upon the earth. In the course of 30 days our snow line retreats on the average about 3°.5 of latitude, or 245 miles. In the 56 days of a Martian month, its snow line at this season retreats 9° of latitude, or 330 miles. For the earth the mean rate is 8 miles per day, for Mars 6 miles. This latter figure is higher than we should expect, based solely on the relative distances of the two planets from the sun.

Habitability for Animal Life.

As this paper was just about to be completed most interesting news was received from our California friends. Some of the earlier spectroscopists thought that they detected the lines of water vapor in the atmosphere of Mars. Lowell with more powerful apparatus confirmed this. Campbell from the summit of Mt. Whitney, altitude 14,800 feet, while not denying their existence, stated that the vapor could not exceed in amount one-quarter of what he found in that portion of our atmosphere that was above him. His observations were made unfortunately in what was the dry season of the planet's year. Now Drs. Adams and St. John, with their 60-inch mirror, find definitely that water vapor exists in the atmosphere of Mars, and is of the order of 5 percent of that found normally in the earth's atmosphere (*Pub. Astron. Society Pacific*, 1925, **37**, 158). To compare it with the water vapor found over our deserts, we should perhaps multiply this figure by 4 or 5. Their observation was made on February 2, 1925. The southern hemisphere of the planet was then turned towards us, the central latitude being —21°.9. The solar longitude ⊙ was 338°.9. Turning now to Figure 1, we see that at this time clouds were heavily condensing to form the northern polar cap, and therefore that nearly all the moisture had left the southern hemisphere. That such was the case is not unfortunate, however, in fact it is distinctly the reverse, since we have now gotten a positive result. It appears that even at their driest season there is a

very appreciable percentage of water in the Martian atmosphere.

This result is distinctly important, though of course we all knew before that Mars is a much drier planet than the earth. If we assume that the polar cap averages a depth of thirty feet of snow, which is certainly as much as could be melted by the sun's heat in a Martian half-year, and that this snow would supply the water for a lake of that size some three feet in depth, then the total amount of water available for natural irrigation, transported back and forth every year across the planet's surface, would be about as much as that contained in our system of Great Lakes. Compared with the water contained in even our smallest ocean, this amount is absolutely negligible.

But the most interesting result that the Mt. Wilson observers have achieved is yet to be mentioned. They have actually detected free oxygen in the Martian atmosphere, to the extent of 15 percent of that found in our own. We had no reason to doubt previously that oxygen existed on Mars, and in the form of iron oxide caused the red color of its soil, but we have had no distinct proof heretofore, other than the presence of vegetation, that oxygen existed in a free state in its atmosphere. According to all our terrestrial experience vegetation not only produces, but for its very existence demands the presence of free oxygen in the atmosphere, so that in that sense the discovery was only what we anticipated, but as a definite corroboration of our previous conclusions, it lays a firm foundation for our next step in advance. This discovery and proof is obviously of the very first importance therefore in connection with the belief that animal life is also present on the planet.

In the recent attempt to climb Mt. Everest it was found that Alpine explorers could climb, without compressed oxygen, to a height of 5.33 miles, and then walk for a couple of hours on a level, and return in safety. The amount of oxygen which they had there was only 35 percent of what we have at sea level. It is therefore clear that animal life, which had developed increased lung capacity, may readily exist on Mars. Indeed if the atmospheric pressure at the Martian surface is greater than with us, thus condensing the oxygen, as the results described in our last Report indicate, then very little modification of their physical structure, as compared with our own animal life, would seem to be necessary. A possibility therefore exists that even human life if transported to Mars might exist, and perhaps flourish there. It would appear that the years 1924 and 1925 have brought us a good deal of interesting information, confirming very satisfactorily our previous beliefs as to the habitability, and existence of animal life of some sort on our next neighbor in space.

Private Observatory,
Mandeville, Jamaica, B. W. I., August 26, 1925.

THIRTY-FOURTH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY.

(Continued from page 538.)

NOTES ON TWO VARIABLE STARS.

By C. M. Huffer.

21 Cassiopeiae (R. A. 1900, $0^h\ 39^m.0$; Dec. $+74°\ 26'$; Spectrum A2). The variability of 21 Cassiopeiae was discovered in 1923 at the Washburn Observatory during observations of 23 Cassiopeiae with the photoelectric photometer, using 21 as the comparison star. No variation in the light of 23 could be detected, but 21 was found to be an eclipsing variable, the loss of brightness at primary being 0.41 magnitude. At secondary, there is an eclipse of 0.07 magnitude.

A preliminary study of the system shows that there is without doubt darkening at the limb of the brighter body. The eclipse at primary is annular; that at secondary is total.

The preliminary elements for a darkened disk are:

$$\begin{aligned} P &= 4^d.46718 \\ t_0 &= \text{J. D. } 2423716.7318 \\ c &= 0 \\ k &= 0.482 \\ i &= 87°.4 \\ J_1/J_2 &= 3.45 \end{aligned}$$

Dr. J. S. Plaskett of the Dominion Astrophysical Observatory has kindly observed this star and derived the spectroscopic orbit. He obtained:

$$\begin{aligned} a_1 \sin i &= 4{,}414{,}300 \text{ km} \\ m_2^3 \sin^3 i/(m_1 + m_2)^2 &= 0.172 \odot \end{aligned}$$

Using these results and assuming $m_1 + m_2 = 2\odot$, we obtain:

$$\begin{aligned} m_1 &= 1.12 \ (\text{Sun} = 1) \\ m_2 &= 0.88 \\ r_1 &= 2.25 \\ r_2 &= 1.08 \\ \rho_1 &= 0.10 \\ \rho_2 &= 0.69 \\ a_1 &= 4{,}418{,}800 \text{ km} \\ a = a_1 + a_2 &= 9{,}990{,}500 \text{ km} \end{aligned}$$

H. R. 8084. (R. A. 1900, $21^h\ 02^m.3$; Dec. 1900, $+30°\ 47'$; Spectrum F5). Announcement was also made of the variation in the light of the star H. R. 8084. The period is $2^d.50$. The variation is about 0.4 magnitude, and is of the Cepheid type.

NOTES ON PLANETARY OBSERVATIONS.

By C. O. Lampland.

The radiometer applied to planetary research has brought important information thus far not directly obtainable by other means. A gratifying beginning has been made in the measurement of the radiation from the planets and in the determination of planetary temperatures, but

there still remains much to occupy the workers in this field in arriving at more complete interpretations of the observational data now available and also in extending the measures on some of the planets. To supplement the results obtained by the radiometer, information and data from other sources, at present incomplete or almost wholly lacking, must be improved and extended.

The planets within reach of effective work with present radiometric installations exhibit an interesting and instructive variety in some of the important factors which influence to a marked extent planetary radiant properties as viewed from space, such as the distance from the sun, and the extent and density of the atmospheric envelopes. But even for bodies with surfaces apparently so accessible as Mercury and the moon, the problem of determining with some degree of accuracy their temperatures is complicated by the presence of the earth's atmosphere and our imperfect knowledge of its selective transmission of the long-wave planetary radiation, under actual observing conditions. For planets with dense and extensive atmospheres the problems of the determination of their surface conditions and temperatures are in some ways still more complicated. We cannot be sure, in the present state of our knowledge, what part of the observed results pertain to the true surface and how much to the atmospheric envelope. The planet Venus is an interesting example of the barrier imposed by its atmospheric veil, which makes visual and photographic observations so difficult and also complicates the interpretation of spectrographic and radiometric observations. Further work on this planet will be needed to fully interpret the observational data now available.

A short account was given of the radiometric work on Mercury now in progress. The observations have been planned to cover as fully as possible all phase angles at which measures can be made, in different parts of the orbit. That parts of the surface become highly heated from the absorption of solar radiation is clearly evident from the very low water-cell transmission (the spectral band between .3 and 1.4μ; practically all of it is reflected sunlight) and from the high percentage of planetary radiation found in the region of shorter wave-lengths than the powerful terrestrial atmospheric absorption bands between 4 and 8μ. The isolation of narrower spectral bands and the measurements of more restricted areas of the planet's surface are obvious improvements to be desired in extending the work.

The photographic evidence of seasonal changes on Mars was presented in a paper by Mr. E. C. Slipher, and was based on his further studies of the extensive material of the Lowell Observatory photographs. The radiometer also brings clearly its evidence of seasonal changes on the planet in the radiometric measures made by Coblentz and Lampland at the 1922 and 1924 oppositions, and very strikingly in the further measures carried out by Lampland for some weeks near the summer solstice of the southern hemisphere of Mars, in October and November, 1924. In the later measures mentioned the settings on the south polar

zone gave the highest value for the total radiation of any part of the planet's disk, and the percentage of transmission by the water-cell the lowest, showing the great increase in the percentage of planetary radiation, and indicating the marked rise in the temperature of the surface in these higher latitudes at the height of summer. The seasonal changes observed radiometrically were at first somewhat puzzling, but upon calculating the insolation curves of the daily amount of solar radiation incident at different latitudes for several dates during the opposition, the results stood explained.

The insolation curves (the daily amount of incident solar radiation for different latitudes) of the earth and Mars (near its perihelion) at the time of the summer solstice of their northern and southern hemispheres, respectively, were shown together with the mean value representations of these curves as modified by the albedoes of the planets and giving a comparison of the amount of solar radiation absorbed by each.

Monochromatic images of Jupiter, taken with the 40-inch reflector, in the infra-red, yellow, and ultra-violet, were shown in a slide. The presence of the planet's extensive atmosphere is evident upon casual inspection of the images, in comparing the ultra-violet image with the yellow and infra-red images; the ultra-violet image is considerably larger.

ASYMMETRIES IN PARALLAX PROGRAMS.

By Oliver J. Lee.

The attention of observers of stellar parallaxes, especially, is called to the need of revision of our programs of stars to be observed. It cannot be urged too often that for statistical purposes the representativeness of the stars investigated is a matter of far greater consequence than the accuracy of the individual determination.

Graphs were shown, giving the distribution of about 1300 stars, for which modern trigonometric parallaxes have been published as given in Schlesinger's *Yale Catalogue*, in galactic latitude and longitude and by spectral type. Northern and small southern latitudes are fairly represented but not those beyond 45 degrees south. Galactic longitudes from 180 to 340 degrees are hardly represented at all.

Three graphs were also shown giving the distribution of spectral type by galactic latitude of 42,046 stars from the *Draper Catalogue*, as abstracted by Van Rhijn in *Groningen Publications* No. 36, Table B; of 1310 faint stars in Kapteyn's Selected Areas 20 to 43 inclusive for which Parkhurst determined the color indices (not yet published) and of 515 faint stars in Selected Areas 44 to 58 inclusive, the color indices for which Dr. Seares has been kind enough to lend me for the present purpose.

These graphs show a widely different distribution of spectral type

from the graph of the published trigonometric parallaxes. This becomes apparent if we take the percentages of spectral types between limits of galactic latitude having the greatest number of stars in each list.

	Percentage						Limits		
Source	B	A	F	G	K	M	Magnitude	Galactic Latitude	No. of Stars
Yale Catalogue	5.2	11.6	20.6	27.8	32.2	2.6	few <10	$+10$ to $+20$	155
Groningen 36	18.7	28.7	14.8	12.6	26.3	2.0	Complete to 8.5	$+20$ to -20	20699
Parkhurst	13.2	24.5	33.0	13.9	13.6	1.8	7 to 14	-10 to -20	302
Seares	0.5	19.4	54.1	14.3	11.2	0.5	— to 16	-27 to -32	196

The ratio of numbers of stars $(A+F)/(G+K)$

Yale Catalogue	Groningen Count (partial)	Draper Catalogue	Parkhurst	Seares
0.54	1.12		2.09	2.88

To urge that parallax observers, using large telescopes, set about correcting this asymmetry by deriving the parallaxes of faint stars in great numbers, is only to reiterate the need which Kapteyn saw nearly forty years ago and which he hoped would be filled by persistent work on the Selected Areas.

RADIATION MEASUREMENTS ON THE CORONA AT THE ECLIPSE OF JANUARY 24, 1925.

By Edison Pettit and Seth B. Nicholson.

The plan of observation was briefly as follows: (1) to measure the radiation from two small areas of the corona and its transmission through a water cell; (2) to determine the distribution of energy in the corona from photographs provided with standard squares. The first measurements, when combined with the second, would give the amount of radiation and its distribution in absolute units.

The radiation apparatus consisted of a 20-inch reflector of 40 inches focal length carrying the thermocouple and transmission screens directly in the focus. A d'Arsonval galvanometer of one second period and a registering device measured the currents produced. These measurements show (1) a slight preponderence of radiation to the violet of 1.3 μ compared with sunlight, (2) that there is practically no radiation of wave-lengths longer than 5.5 μ, and hence rock-salt windows are not necessary on the radiation apparatus; (3) that the intensity of the coronal radiation 4'.6 from the limb in the equatorial region was 5.28×10^{-7} sunlight. A deflection of 65 mm was obtained from the free radiation.

The photographs were made with a 6-inch lens of 15 feet focal length, using both blue and red light. The plates were placed on the registering microphotometer and rotated beneath the microscope in such a manner that transmission curves were registered in contiguous zones of the corona concentric with the moon's image. These curves, when reduced to intensity curves and corrected for scattered light and

halation, show that the intensity of the energy at the equator is more than twice that at the poles while that in the streamers is three times as great.

A plot of the mean intensities in the zones shows that the intensity of the coronal light varies inversely with the sixth power of the distance from the sun's center for the blue light and inversely with the seventh power for the red light. The corona, therefore, becomes redder as the sun's limb is approached. After the constants, which include the known ratio of moon-light to sun-light, had been determined, an integration of these expressions, or a summation of the zone-intensities, showed that the intensity of the coronal light was 19.3×10^{-7} calories per sq. cm per min. or 0.47 full-moonlight. When corrected for over-lapping moon, the ratio becomes 0.52. The value obtained by Briggs in 1922, when corrected to mean distance and for over-lapping moon, was 0.41, while that obtained by Kunz and Stebbins in 1918 was 0.55. These values are in harmony with the variations in the solar constant, although not of the same amplitude.

That the amount of red light increases from the outer corona toward the limb of the sun is not what one might expect from a theory of solid or liquid particles, since in that case the temperature would be higher near the sun, which would necessitate an excess of blue light.

ROTATION OF THE SUN.

By Chas. E. St. John.

The equatorial velocities given by the Mount Wilson observations of the last eleven years are, year by year:

Year	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924
Velocity in km/sec.	1.92	1.96	1.91	1.94	1.95	1.90	1.90	1.91	1.91	1.89	1.91

The mean for the first five years is 1.936 km/sec, that for the last six years is 1.903 km/sec. The decrease of 1.7 per cent is small but in view of the constancy for the last six years it appears to have a basis of reality. The probability is further increased by comparison with previous results obtained by observers using the same procedure:

Adams and Lasby	1906.5 - 1908.5	2.06 km/sec.
Ottawa and Pittsburgh	1911.5 - 1913.5	2.00 km/sec.
St. John and Ware	1919 - 1924	1.90 km/sec.

The years 1906.4 - 1908.5 were in the midst of a spot maximum during which the polarity of the preceding spot was positive in the northern and negative in the southern hemisphere. The Ottawa and Pittsburgh observations covered the time near minimum during which the reversal of polarity occurred, while the later Mount Wilson observations were made during the succeeding cycle after complete reversal. If reversal of polarity means a reversal of the direction of the whirl in the spot vortex, and if the direction of the drift of the solar atmo-

sphere in the equatorial belt is associated with the direction of the whirl, we have possibly the means of determining the direction of the vortex whirl. The elucidation of the question requires observations of the solar rotation under constant observing conditions over a still longer period, perhaps over the full 22-year cycle, at least well into the approaching maximum.

FURTHER PHOTOGRAPHIC STUDY OF MARS.

By E. C. Slipher.

Several phases of the study of Mars were discussed in this paper, especially seasonal changes in the markings, and results with color-filter photographs. Both direct photographs of the planet, and experimental ones of terrestrial objects were exhibited in support of conclusions.

First, the extent and character of seasonal changes on the surface of the planet were portrayed by examples of homogeneous photographs taken during 1924 with the 24-inch refractor, exposing through a yellow color-filter on yellow sensitive plates. The photographs extended over a period of about five months and the examples exhibited were separated by intervals of about one month. Photographs of the same face of the planet were arranged on the same slide in order of date. They represented a Martian seasonal period that corresponds to our own from late April to early July. Comparison of the photographs brought out the gradual decrease of the southern polar cap, and the marked darkening of the large blue-green areas of the southern hemisphere in unison with the advance of summer there. The same photographs displayed no change in the great yellow areas of the planet, other than rare and small atmospheric ones, which evidence that the seasonal changes shown in the other markings are not attributable to Martian atmospheric causes but are inherent to the planet's surface.

Next, yellow and blue color-filter photographs, taken practically simultaneously and combined on the same slides, were exhibited to show the marked difference in the appearance of the planet, when pictured in monochromatic light of widely separated wave-lengths. The combinations shown were selected from a series secured in June and July, 1922. The photographs made in blue light show the polar caps much more prominently than those made in yellow light, while the dark blue-green markings which are conspicuously recorded in yellow and red-light photographs are rendered almost invisible in the photographs with blue light. The series of photographs from blue, yellow, and red light, secured on July 9, 1922, are of particular interest in connection with the behavior of Martian clouds and atmosphere when photographed in light of various wave-lengths, as they were taken to record the great cloud covered area then existing in the tropics of Mars. The photographs in yellow light show this phenomenal marking conspicuously bright, while the images from blue light render it invisi-

ble. Since this bright area was in the Martian atmosphere the failure of the blue-light images to show it can hardly be attributed to the impenetrability of the intervening Martian atmosphere for the short wave-lengths, because on these same images the polar caps stand out strongly enhanced.

The colors of the different markings on Mars modify the resulting monochromatic photographs, and not all of the fading out of the markings in the violet-light pictures can be attributed to Martian atmosphere. In support of this conclusion red, yellow, blue and ultra-violet light photographs of terrestrial landscapes, possessing color relations similar to those on Mars, were exhibited.

The existence of a Martian atmosphere, which has long since been abundantly demonstrated by the observations here, has been repeatedly revealed by the photographs as early as 1907.

THERMO-ELECTRIC MEASURES OF CORONAL RADIATION.

By H. T. Stetson and W. W. Coblentz.

Measures of radiation from the solar corona were made at Middletown, Connecticut, at the eclipse of January 24, 1925, using a 6-inch reflecting telescope, vacuum thermocouple and d'Arsonval galvanometer.

The thermocouple was constructed of bismuth-silver junctions with twin receiving surfaces 1.5 mm x 5 mm, so designed as to be capable of being set simultaneously on the dark of the moon for a zero reading, and so mounted as to be easily moved from side to side, exposing alternately either of the two junctions to the corona while the other remained on approximately the center of the moon's disk for a zero standard. Such design and method of operation seem to present distinct advantages over any method previously used.

Just inside the focal plane of the telescope and in front of the receivers, a slide carrier made possible the interposition of a water-cell for determining water-cell transmission. On account of the extremely low temperatures prevailing at Middletown, glycerine was substituted for water. Its transmission curve has been determined and found to be practically identical with that of water.

The mean of three series of measures, when corrected for reflection from the front surface of the cell and for absorption by the two mirrors, gave approximately 33 per cent transmission through the glycerine cell for the radiation from the corona, as compared to about 69 per cent transmission of direct sunlight.

The surprisingly low glycerine-cell transmission seems to indicate a relatively large amount of infra-red radiation and would lead to the conclusion that the black body temperature of the corona as measured at Middletown should be placed around 3000° C. When we consider that the corona is seen in perspective and that while the receiver was

set near the moon's limb, yet a considerable depth of the widely scattered coronal material was also contributing its radiation to the thermopile, the relatively low temperature indicated by our results would not appear inconsistent with the emission of blue and ultra-violet light known to exist in the corona.

It is suggested that particles of matter, possibly oxides in the outer part of the corona absorbing solar radiation and re-emitting in longer wave-lengths, may be responsible for the large infra-red radiation observed.

In comparing our results with those of Abbot in 1908, the only previous data where a black body receiver was employed, it is found that there is agreement in the indication of proportionally greater infra-red radiation from the corona than from the sun. The comparatively larger value of infra-red radiation from the corona observed in the present instance can well be accounted for by the substitution of fluorite for the window of the receiver, as compared with glass used in the earlier work. Abbot's estimate of 6000° C for the temperature of the corona is consequently too high. On the other hand our value for some unknown reason may perhaps be at the other extreme—too low. However, all the radiometric data now published are in agreement in indicating that the corona contains matter in a liquid and perhaps solid state which reflects solar radiation as conjectured from the presence of polarized light and the Fraunhofer lines.

ASTRONOMY, THE PUBLIC, AND SCIENCE SERVICE.

By James Stokley.

Science Service, as the institution for the popularization of science, aims to supply the latest news in all the branches of science, written in an accurate, yet popular, manner by trained writers. This material is sold to the newspapers of the country, chiefly through the *Daily Science News Bulletin* to which many of the leading newspapers subscribe. In the aggregate, these papers reach several million readers. The same articles are also used in the *Science News Letter*, to which individuals may subscribe, and many appear weekly in the "Science News" section at the back of *Science*. Important scientific meetings are reported in the *Bulletin* from advance abstracts, when possible, the articles being issued for release when the papers are presented. In addition, as with the present meeting, a special telegraphic service is supplied to a number of metropolitan dailies.

In order to be of the greatest possible usefulness both to the astronomers and our readers, we request that we be promptly informed of the progress and results of important researches, new discoveries and other news of general interest. This should be sent us far enough in advance of its release to the local papers, if such release is made, to permit our subscribing newspapers to have it for use at the time it is desired to

be made public, as the *Bulletin* is sent out by mail. As much of our material is written by our correspondents, rather than by the Washington staff, we are glad to receive popular accounts of new lines of work, written by the scientists themselves. Such contributions by members of observatory staffs, on the work of their institutions, would be welcomed, and, if available for use, will be purchased. The director particularly wants to get in touch with young men and women in the various sciences who have literary inclinations and would be willing to submit to rigorous criticism and training with a view to making the writing of popular science a part of their life work.

Communications and news material may be addressed to Science Service, 21st & B Streets, N. W., Washington, D. C.

ON THE MOTIONS OF THE CALCIUM CLOUDS IN SPACE.

By Otto Struve.

A recent investigation by the writer of the radial velocities, and of the intensities of stationary calcium lines in stars of spectral type B3 and earlier, shows that several separate clouds can be outlined. The clouds are more numerous in and near the Milky Way, but occasionally they occur also in high galactic latitudes. Some of the calcium clouds show systematic motions which cannot be attributed to the effect of blending with a line of purely stellar origin. The following table contains the more conspicuous clouds with their average velocities referred to the stellar system:

Calcium Cloud	Residual Velocity
Orion-Monoceros	+ 1.2 km/sec.
Perseus-Cassiopeia	—12.0
Lacerta	— 9.2
π Cygni	—14.0
Cygnus	+ 4.8
Scorpius	+ 5.2

A more detailed paper will appear in an early number of Popular Astronomy.

CHANGES IN THE BRIGHT LINES OF HYDROGEN IN 5 κ DRACONIS.

By Otto Struve.

Bright hydrogen lines were discovered in the spectrum of κ Draconis (Spectrum Be) in 1890 by E. C. Pickering. According to Miss Maury this spectrum resembles that of the star γ Cassiopeiae. The emission line at Hβ appeared as a bright band. Further observations were made by Merrill at the Lick Observatory. In 1911 he found faint emission in Hβ, while in 1912 Hβ appeared as a strong, double, bright line superposed on absorption. He did not attach importance to the faintness of the emission line in 1911, attributing it to an unsuitable emul-

sion. R. H. Baker's observations at Ann Arbor cover the years 1912 to 1919. Hβ appeared bright on all plates. A heavy emission line was superposed on wide absorption and a narrow absorption line was placed over this emission. The emission line did not change appreciably from 1912 to 1919, but the narrow absorption line exhibited variations in position and width. W. J. S. Lockyer observed the star in 1915 and his description of Hβ is nearly identical with that of Baker. Henroteau found in 1920 that the emission lines had possibly somewhat weakened since Baker's observation. More recently the star was observed by Merrill at Mount Wilson. In 1924 he finds that Hα is "strong, bright."

The Yerkes observations are collected in the following table:

Plate	Date	Quality	Description
B 287	1902 Feb. 2	good	Fairly strong emission present. A broad absorption line is superposed on this emission. The width of the absorption line is equal to that of each bright component.
B 406	1902 Sept. 13	fair	Resembles plate B 287, but the emission line is much fainter.
IB 269	1904 Jan. 23	good	The emission line is extremely weak. The absorption line is very strong and broad.
IB 473	1904 Dec. 30	good	No emission present. Resembles that of ordinary B-type stars with wide and diffuse absorption lines.
IB 2626	1911 Jan. 2	fair	Faint double emission line. Resembles plate B 406.
IB 5659	1919 Dec. 29	good	A strong and broad emission band is centrally superposed on wide absorption. No absorption line can be seen on the bright band.
IB 5667	1920 Jan. 9	good	Same as IB 5659.
IB 5683	1920 Feb. 29	good	The emission band resembles plate IB 5659, but a narrow absorption line is superposed over the band. Its width is about 0.1 that of the emission band.
IB 5759	1920 Apr. 5	good	Same as IB 5683.
IR 7719	1925 Feb. 12	good	The emission band is about as strong as on plate IB 5683. The narrow emission line is a little stronger.
IR 7720	1925 Feb. 12	good	Same as plate IR 7719.

All the observations taken together seem to show that the emission line was strong in 1890. It was fainter in 1902 and disappeared completely in 1904. In 1911 it was again faintly visible, increasing in brightness until 1919, after which time it remained practically of the same brightness. The narrow absorption line which is superposed over the bright band also undergoes considerable change. Apparently it increases in intensity and width as the emission line weakens. At times it disappears completely. This seems to happen while the bright band is at its greatest brilliancy. The changes in the bright band seem to indicate a variation with a period of about thirty years. The observations are not sufficiently numerous, however, to exclude the possibility of shorter oscillations.

SOME NEW METHODS IN PRACTICAL ASTRONOMY.

By Charles Clayton Wylie.

I. *Rating a Sidereal Timepiece by Standard Time Signals.*

The Greenwich sidereal time at the instant of a time signal is the Greenwich sidereal time of the preceding midnight plus the sidereal interval since. The sidereal interval is a constant for the hour of the signal. For example,

Greenwich sidereal time of noon Eastern time = Greenwich sidereal time midnight + $17^h\ 2^m\ 47^s.56$.

Any navigator or explorer using the Annapolis signal at this hour can thus easily rate the chronometer on Greenwich sidereal time.

Since local time = Greenwich time—Longitude West, the reduction for any local time is obtained by subtracting the longitude from the reduction to Greenwich sidereal time. Thus, assuming the longitude of Northfield $6^h\ 12^m\ 36^s.00$, we have

Northfield sidereal time of noon Eastern time = Greenwich sidereal time midnight + $10^h\ 50^m\ 11^s.56$.

The correction to an observatory clock is usually known within a few seconds. If such is the case, seconds only need be recorded in comparing with the signal, and the reduction is merely mental.

II. *Time by Observations at Equal Altitudes.*

The correction for motion of the sun in declination is put by Chauvenet in the form

$$\Delta T^s = (A \tan \phi + B \tan \delta)\ \Delta\delta''.$$

If only observations made on the same day are to be reduced the form

$$\Delta T^s = (A + B)\ \Delta\delta''$$

is more convenient. Tables have been prepared giving A and B to three places in natural numbers for latitudes 0° to 60° inclusive. These tables have been used for the reduction of many problems, but are not as yet thoroughly checked.

As the correction does not ordinarily exceed 15 seconds, three-place work is sufficient with the sextant and engineer's transit. The 5-place and 7-place work of some textbooks gives a wrong impression as to the labor necessary.

III. *Time by Altitudes Somewhat Different.*

Observations at approximately the same altitude in the east and in the west are often made to eliminate errors. When such are secured, it is unnecessary to reduce them separately for time. The correction to the mean for difference in zenith distance is

$$\Delta T = \tfrac{1}{2}(t_w + t_e),$$

where

$$\sin \tfrac{1}{2}(t_w + t_e) = [\sin \tfrac{1}{2}(z_w + z_e) \sin \tfrac{1}{2}(z_w - z_e)] \,/\, [\cos \phi \cos \delta \sin \tfrac{1}{2}(t_w - t_e)]$$

This correction approaches zero with $(z_w - z_e)$, and unless the observations are at very different altitudes, 4-place logarithms suffice.

IV. *Azimuth by Two Stars at the Same Altitude.*

In low latitudes the standard text-book methods of azimuth by circumpolar stars fail. The method of equal altitudes is often used, but has the objection that a long wait is necessary to secure the second observation.

The advantages of the method of equal altitudes are obtained, without the long wait, by observing two stars of nearly the same declination on opposite sides of the pole. Counting the azimuth from the north point (for northern stars) the correction to the mean is

$$\Delta A = \tfrac{1}{2}(A_1 + A_2).$$

and

$$\sin \tfrac{1}{2}(A_1 + A_2) = [\cos \tfrac{1}{2}(\delta_1 + \delta_2) \sin \tfrac{1}{2}(\delta_1 - \delta_2)] \div [\cos \phi \sin z \sin \tfrac{1}{2}(A_1 - A_2)]$$

The correction is zero for stars of the same declination, and approaches zero with $(\delta_1 - \delta_2)$.

V. *Reduction to Meridian.*

Chauvenet remarks that by substituting the arc for the sine, the reduction to meridian can be put in the form $R = at^2$, where t is the hour angle; or the form $R = aA^2$, where A is the azimuth. This form is sufficiently accurate for work with the sextant or engineer's transit, and is very convenient if the slide rule is used in reduction. With the "square" scale, the reductions are read off at a single setting (t or A as argument) in about the time ordinarily spent in copying the m's from the tables in texts on practical astronomy.

VI. *The Gradienter Screw for Equal Altitudes Work with an Engineer's Transit.*

In observing two stars at the same altitude for time or azimuth, we have used the gradienter screw to obtain five or more readings on each star, instead of one. Readings on the first star are taken at regular settings of the gradienter, and on the second star at the same settings in reverse order.

ON THE DIRECTION OF SHADOW BANDS.

By Charles Clayton Wylie.

It is here proposed that the shadow bands seen at the time of a total eclipse of the sun can be explained as follows:

The normal atmospheric irregularities produce, when a surface is illuminated by a point source of light at a great distance, a pattern of light and dark mottlings. By letting star light fall on a white screen in an otherwise dark room Professor Russell has seen these mottlings in the light of Sirius and other bright stars.

Due to overlapping of patterns from different parts of the sun, the mottlings are not seen in sunlight ordinarily; but at the time of an eclipse, just before totality, the exposed edge of the sun is practically a line. There is therefore, at this time overlapping in one direction only, which greatly elongates the mottlings in the direction of the length of the line source of light, producing a banded effect.

Surface irregularities would obviously spoil the bands produced by the upper atmospheric layers. We would expect a sort of convection current pattern, similar to that seen when the sun shines over a warm radiator on a winter day. The overlapping from surface irregularities being much less, the patterns should be seen for a longer time.

Observation confirms these conclusions. The warm air overlying cities and towns on the cold winter morning undoubtedly produced great surface irregularities at the time of the recent eclipse. The records show that some of the most careful observers could see no banded effect. Where an attempt was made to estimate the direction of the bands, it is found that, with one exception, they lay approximately in the plane of the slender crescent of uneclipsed sun; but the residuals are larger than for observations in the country.

Observations in 1900, 1905, 1918 and 1925 have been examined, and it is found that where a good set of bands is observed the direction is practically parallel to the plane of the vanishing or reappearing crescent.

Persons observing good sets of bands near the edge of the shadow are sometimes puzzled at the change in direction. Each set has a definite and fixed direction; but the second set, beginning perhaps a few seconds after the close of the first may have a direction differing by nearly ninety degrees from the first. The directions can be computed as accurately for these points as for points near the center of the path of totality.

NOTE ON THE ECLIPSING VARIABLE WW AURIGAE.

By Charles Clayton Wylie.

This variable was observed with a sliding prism photometer attached to the 12-inch telescope of the University of Illinois. The eleventh magnitude companion in position angle 77°, distance 153″, was used as comparison star. From 3288 sets of measures, fifty-one normals have been formed and the following elements obtained:

$$\text{Primary Minimum} = \text{J. D. } 2421623.3533 + 2^{d}.525017 \cdot E.$$

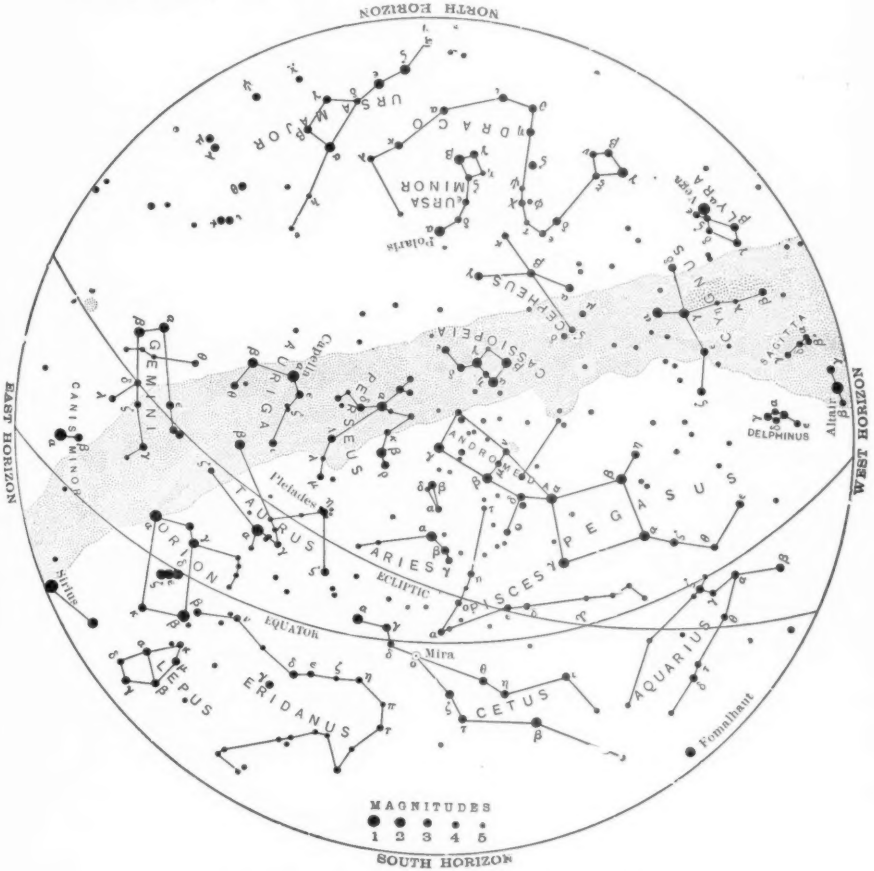
It is of interest that although the primary and secondary minima differ by one-fifth of a magnitude, the variable star catalogues are giving half the correct period.

From light elements based on some of the first of these observations, and Joy's spectroscopic results the writer published provisional values for the absolute dimensions of the system in Popular Astronomy, **31**, 93, 1923. Results based on the entire series are now being obtained.

EAST HORIZON

PLANET NOTES FOR DECEMBER.

The *Sun* will move eastward from the constellation Ophiuchus into the constellation Sagittarius. Its position on December 1 will be $16^h\ 26^m$, $-21°\ 42'$; and on December 31, $18^h\ 38^m$, $-23°\ 9'$. It reaches its farthest point south on December *22*, which marks the time of the winter solstice. Its greatest declination south will be practically $-23°\ 27'$.



THE CONSTELLATIONS AT 9:00 P. M. DECEMBER 1.

The phases of the *Moon* will occur as follows:

Last Quarter	Dec. 8	at 6 A.M.	C.S.T.
New Moon	15 "	1 P.M.	"
First Quarter	22 "	5 A.M.	"
Full Moon	29 "	8 P.M.	"

The moon will be farthest from the earth for the month on December 5, and nearest to the earth on December 17.

Mercury will be moving westward in the sky until December 23, after which it will begin to move eastward slowly. On December 11, it will be at a point of inferior conjunction, that is, it will pass the sun on the side towards the earth. On December 31, Mercury will be at a point of greatest elongation west of the sun. It will however be about 13° south of the sun and consequently will not rise very long before the sun. It will therefore not be a particularly favorable elongation for observing the planet.

Venus will continue to be a brilliant object in the evening sky through December. Having passed a point of greatest elongation east on November 28, it will be somewhat lower in the sky from evening to evening. On December 31, it will cross the meridian a few minutes before 3 o'clock. It will be unmistakable among the stars because of its great brilliance.

Mars will be a few hours west of the sun during December. On December 1, it will cross the meridian at 10 o'clock in the morning and on December 31, at 9:24. It will therefore be in a position for observation in the early morning. On December 15, it will be very near the star Beta Librae.

Jupiter will be visible low in the southwest at sunset during December. It will be too near the horizon for profitable study. On December 15, it will be in the eastern part of the constellation Sagittarius, in a region devoid of bright stars. It will be moving away from the earth and on December 15 it will be about six times the mean distance from the earth to the sun away from the earth.

Saturn will rise a short time before the sun at the beginning of the month, and at the end of the month it will rise between 2 and 3 hours before the sun. It will therefore not be well situated for study. On December 15, it will be near the center of the constellation Libra. This planet will be approaching the earth and at the middle of the month will be approximately 11 times the mean distance from the earth to the sun away from the earth.

Uranus will cross the meridian on the average about 6 o'clock in the evening. It will therefore be in a favorable position. On December 15, it will be in the constellation Pisces, 4° south of the equator.

Neptune will cross the meridian on the average about 4 o'clock in the morning. It can therefore be seen any time after midnight during this month.

Occultations Visible at Washington.

[From the *American Ephemeris.*]

Date 1925		Star's Name	Magnitude	IMMERSION. Washington C.T.	IMMERSION. Angle from N	EMERSION. Washington C.T.	EMERSION. Angle from N	Duration
				h m	°	h m	°	h m
Dec.	1	353 B. Tauri	6.5	2 31	78	3 53	270	1 22
	3	120 B. Gemin.	6.5	4 47	64	5 52	314	1 5
	3	79 Geminorum	6.3	19 0	113	19 48	243	0 48
	20	74 Aquarii	5.8	18 45	70	19 55	234	1 11
	21	376 B. Aquarii	6.3	19 56	10	20 43	290	0 47

VARIABLE STARS.

Minima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1925 December							
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
SY Androm.	0 08.0	+43 09	9.5—13.0	34 21.8			14 10					
RT Sculptor.	31.5	—26 13	9.6—10.5	0 12.3	2 14		10 6		17 23		25 15	
U Cephei	0 53.4	+81 20	7.0— 9.0	1 11.8	5 23		13 11		20 22		28 10	
Z Persei	2 33.7	+41 46	9.4—12	3 01.4	3 17		9 20		22 1		28 4	
TW Cassiop.	37.6	+65 19	8.2— 9.0	1 10.3	5 12		14 2		22 15		31 5	
RY Persei	39.0	+47 43	8.0—10.3	6 20.7	3 10		10 7		24 0		30 21	
RZ Cassiop.	39.9	+69 13	6.9— 8.1	1 04.7	1 19		8 23		23 7		30 12	
TX Cassiop.	44.4	+62 22	9.4—10.1	2 22.2	6 11		15 6		24 0			
ST Persei	53.7	+38 47	8.5—10.5	2 15.6	1 16		9 15		17 14		25 12	
RX Cassiop.	2 58.8	+67 11	8.6— 9.1	32 07.6	6 17							
Algol	3 01.7	+40 34	2.3— 3.5	2 20.8	7 15		16 6		24 20			
RT Persei	16.7	+46 12	9.5—11.5	0 20.4	2 15		9 10		23 0		29 19	
λ Tauri	55.1	+12 12	3.3— 4.2	3 22.9	2 21		10 19		18 16		26 14	
RW Tauri	3 57.8	+27 51	7.1— [11	2 18.5	1 16		9 23		18 7		26 14	
RV Persei	4 04.2	+33 59	9.5—11.0	1 23.4	2 9		10 6		18 4		26 1	
RW Persei	13.3	+42 04	8.8—11.0	13 04.8	8 1				21 5			
SZ Tauri	31.4	+18 20	7.2— 7.7	3 03.6	4 8		10 15		23 6		29 1	
RS Cephei	4 48.6	+80 06	9.5—12.0	12 10.1	8 20				21 6			
TT Aurigae	5 02.8	+39 27	7.8— 8.7	0 16.0	1 13		8 5		21 13		28	
RY Aurigae	11.5	+38 13	10.7—11.7	2 17.5	9 4		17 8		25 13			
RZ Aurigae	42.9	+31 40	10.6—13.3	3 00.3	7 14		13 14		25 15		31 16	
SV Tauri	45.8	+28 05	9.4—11.0	2 04.0	6 3		14 19		23 11			
Z Orionis	50.2	+13 40	9.7—10.7	5 04.9	8 19		19 5		29 15			
SV Gemin.	54.6	+24 28	9.8— [11	4 00.2	2 18		10 18		18 18		26 19	
RW Gemin.	5 55.4	+23 08	9.5—11.0	2 20.8	7 16		13 9		24 20		30 14	
U Columbæ	6 11.2	—33 03	9.2—10.0	2 19.2	3 7		14 12		20 13		31 7	
SX Gemin.	22.0	+20 37	10.8—11.5	1 08.8	6 6		14 11		22 16		30 20	
RW Monoc.	29.3	+ 8 54	9.0—10.8	1 21.7	4 18		12 9		20 0		27 15	
RX Gemin.	43.6	+33 21	8.8— 9.6	12 05.0	4 23		17 4		29 9			
RU Monoc.	6 49.4	— 7 28	9.8—10.5	0 21.5	6 5		13 9		20 13		27 17	
R Can. Maj.	7 14.9	—16 12	5.8— 6.4	1 03.3	4 8		11 3		24 19		31 14	
RY Gemin.	21.7	+15 52	8.9— [10	9 07.2	4 0		13 7		22 14		31 21	
Y Camelop.	27.6	+76 17	9.5—12	3 07.3	6 12		13 3		19 18		26 8	
TX Gemin.	30.3	+17 08	10.0—11.9	2 19.2	9 5		17 15		26 0			
RR Puppis	43.5	—41 08	9.4—10.7	6 10.3	2 2		8 12		21 8		27 19	
V Puppis	7 55.4	—48 58	4.1— 4.8	1 10.9	5 8		12 14		19 21		27 3	
X Carinae	8 29.1	—58 53	7.9— 8.7	0 13.0	4 6		12 8		20 12		28 14	
S Cancri	8 38.2	+19 24	8.2—10	9 11.6	9 10		18 21		28 9			
RX Hydrae	9 00.8	— 7 52	9.1—10.5	2 06.8	3 8		10 4		23 21		30 17	
S Velorum	29.4	—44 46	7.8— 9.3	5 22.4	6 15		12 13		24 10		30 9	
Y Leonis	9 31.1	+26 41	9.3—11.2	1 16.5	4 1		10 19		24 7		31 1	
RR Velorum	10 17.8	—41 36	10.0—10.9	1 20.5	4 16		12 2		19 12		26 22	
SS Carinæ	10 54.2	—61 23	12.2—12.8	3 07.2	7 9		14 0		20 14		27 5	
ST Urs. Maj.	11 22.4	+45 44	6.7— 7.2	8 19.2	1 7		10 2		18 21		27 16	
RW Urs. Maj.	35.4	+52 34	10.3—11.4	7 07.9	6 13		13 20		21 4		28 12	
Z Draconis	11 39.8	+72 49	9.9—13.6	1 08.6	5 17		12 12		19 7		26 2	
RZ Centauri	12 55.6	—64 05	8.5— 8.9	1 21.0	1 12		9 0		24 0		31 12	
RS Can. Ven.	13 06.3	+36 28	7.5—12.5	4 19.1	6 11		16 1		25 16			
SS Centauri	07.2	—63 37	8.8—10.4	2 11.5	6 9		13 19		21 6		28 16	
SX Hydræ	13 39.0	—26 23	8.6—12.7	2 21.5	1 2		12 14		18 9		29 23	

Minima of Variable Stars of Short Period—Continued.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1925 December					
	h m	° ′		d h	d h	d h	d h	d h	d h	d h
δ Libræ	14 55.6	— 8 07	4.8— 6.2	2 07.9	1 14	8 14	22 13	29 13		
U Coronæ	15 14.1	+32 01	7.6— 8.7	3 10.9	3 8	10 6	24 1	30 23		
TW Draconis	15 32.4	+64 14	7.3— 8.9	2 19.4	6 22	15 8	23 18			
SS Libræ	15 43.4	—15 14	9.3—11.5	0 18.4	1 15	8 20	23 5	30 9		
SW Ophiuchi	16 11.1	— 6 44	9.2—10.0	2 10.7	4 4	11 12	18 20	26 4		
SX Ophiuchi	12.6	— 6 25	10.5—11.2	2 01.5	1 13	9 19	18 1	26 7		
R Aræ	31.1	—56 48	6.8— 7.9	4 10.2	1 16	10 12	19 9	28 5		
TT Herculis	16 49.9	+17 00	8.9— 9.3	20 18.1		19 16				
TU Herculis	17 09.8	+30 50	9.5—12	2 06.4	3 10	10 5	23 20	30 15		
U Ophiuchi	11.5	+ 1 19	6.0— 6.7	0 20.1	1 16	10 1	18 11	26 20		
u Herculis	13.6	+33 12	4.6— 5.4	2 01.2	1 16	7 19	20 3	26 6		
TX Herculis	15.4	+42 00	8.3— 9.0	1 00.7	5 5	11 9	23 17	29 22		
RV Ophiuchi	29.8	+ 7 19	9. —12	3 16.5	6 23	14 8	21 17	29 2		
SZ Herculis	36.0	+33 01	9.5—10.3	0 19.6	8 9	16 14	24 18			
TX Scorpii	48.6	—34 13	7.5— 8.2	0 22.6	3 19	11 8	18 21	26 10		
UX Herculis	49.7	+16 57	8.8—10.5	1 13.2	4 23	11 17	19 11	27 5		
Z Herculis	53.6	+15 09	7.1— 7.9	3 23.8	1 6	9 6	17 5	25 5		
WX Sagittarii	53.6	—17 24	9.2—10.8	2 03.1	2 4	10 17	19 5	27 17		
WY Sagittarii	17 54.9	—23 01	9.5—10.6	4 16.0	4 0	13 8	18 0	27 9		
SX Draconis	18 03.0	+58 23	9.3—10.5	5 04.1	4 0	14 9	19 13	29 21		
RS Sagittarii	11.0	—34 08	5.9— 6.3	2 10.0	8 3	15 9	22 15	29 21		
V Serpentis	11.1	—15 34	9.5—11.1	3 10.9	2 1	8 23	22 19	29 16		
RZ Scuti	21.1	— 9 15	7.4— 8.3	15 03.2		12 6		27 10		
RZ Draconis	21.8	+58 50	9.5—10.2	0 13.2	2 14	9 18	24 2	31 6		
RX Herculis	26.0	+12 32	7.0— 7.6	0 21.3	4 17	11 19	18 22	26 1		
SX Sagittarii	39.7	—30 36	8.7— 9.8	2 01.8	7 1	15 9	23 16			
RR Draconis	40.8	+62 34	9.3—13	2 19.9	7 19	16 7	24 19			
RS Scuti	43.7	—10 21	9.3—10.3	0 15.9	1 18	8 9	21 16	28 8		
β Lyræ	46.4	+33 15	3.4— 4.1	12 21.8		12 12	25 10			
U Scuti	18 48.9	—12 44	9.1— 9.6	0 22.9	8 7	15 22	23 14	31 5		
RX Draconis	19 01.1	+58 35	9.3—10.2	1 21.4	3 17	11 7	18 21	26 11		
RV Lyræ	12.5	+32 15	11. —12.8	3 14.4	5 18	12 23	20 4	27		
RS Vulpec.	13.4	+22 16	6.9— 8.0	4 11.4	8 18	17 17	26 16			
U Sagittæ	14.4	+19 26	6.5— 9.0	3 09.1	5 12	12 6	19 0	25 18		
Z Vulpec.	17.5	+25 23	7.3— 8.5	2 10.9	6 20	14 5	21 13	28 22		
TT Lyræ	24.3	+41 30	9.4—11.6	5 05.8	4 15	15 3	20 8	30 20		
UZ Draconis	26.1	+68 44	9.0— 9.8	1 15.1	1 6	7 19	20 20	27 9		
SY Cygni	19 42.7	+32 28	10. —12	6 00.2	3 6	9 7	21 7	27 7		
WW Cygni	20 00.6	+41 18	9.3—13.4	3 07.6	4 19	11 10	24 17	31 8		
SW Cygni	03.8	+46 01	9. —11.7	4 13.8	1 12	10 16	19 19	28 23		
VW Cygni	11.4	+34 12	9.8—11.8	8 10.3	7 20	16 6	24 16			
RW Capric.	12.2	—17 59	8.8—10.6	3 09.4	2 23	9 18	23 8	30 2		
UW Cygni	19.6	+42 55	10.5—13	3 10.8	2 3	9 1	22 20	29 18		
V Vulpec.	32.3	+26 15	8.2— 9.8	37 19.0		13 23				
W Delphini	33.1	+17 56	9.4—12.1	4 19.4	4 6	13 21	23 12			
RR Delphini	38.9	+13 35	10.5—11.8	4 14.4	3 21	14 1	23 6			
Y Cygni	48.1	+34 17	7.1— 7.9	1 12.0	7 10	16 10	25 10			
WZ Cygni	49.3	+38 27	9.9—10.8	0 14.0	6 7	13 21	21 11	29 2		
RR Vulpec.	20 50.5	+27 32	9.6—11.0	5 01.2		10 22	21 1	31 3		
RY Aquarii	21 14.8	—11 14	8.8—10.4	1 23.2	8 10	16 7	24 4			
UZ Cygni	55.2	+43 52	8.9—11.6	31 07.3				24 4		
RT Lacertæ	21 57.4	+43 24	9.1—10.5	5 01.7	2 10	12 14	22 17			
RW Lacertæ	22 40.6	+49 08	10.2—11.2	5 04.4	5 21	11 2	21 11	26 15		
VW Pegasi	51.7	+32 42	10.0—10.6	5 06.4	5 11	16 0	21 7	31 20		
Y Piscium	23 29.3	+ 7 22	9.0—12.0	3 18.4	5 11	14 0	20 12	28 1		
TW Androm.	23 58.2	+32 17	8.6—11.5	4 02.9	3 5	11 11	19 17	27		

Maxima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of maxima in 1925 December					
	h m	° ′		d h	d h	d h	d h	d h	d h	d h
SX Cassiop.	0 05.5	+54 20	8.6— 9.2	36 13.7	10 3					
SY Cassiop.	0 09.8	+57 52	9.3— 9.9	4 01.7	5 20	13 23	22 3	30 6		
RR Ceti	1 27.0	+ 0 50	8.3— 9.0	0 13.3	7 4	14 22	22 15	30 10		
RW Cassiop.	1 30.7	+57 15	8.9—11.0	14 19.2	7 15		22 10			
V Arietis	2 09.6	+11 46	8.3— 9.0	0 23.8	5 11	13 10	21 8	29 7		
SU Cassiop.	2 43.0	+68 28	6.5— 7.0	1 22.8	7 23	15 18	23 13			
RW Camelop.	3 46.2	+58 21	8.2— 9.4	16 00.0		15 17				
SX Persei	4 10.2	+41 27	10.4—11.2	4 07.0	2 0	10 14	19 4	27 18		
SV Persei	42.8	+42 07	8.8— 9.6	11 03.1	1 4	12 7	23 10			
RX Aurigæ	4 54.5	+39 49	7.2— 8.1	11 15.0	4 14	16 5	27 20			
SX Aurigæ	5 04.6	+42 02	8.0— 8.7	1 12.8	1 21	9 13	17 5	24 20		
SY Aurigæ	05.5	+42 41	8.4— 9.5	10 03.3	9 1	19 5	29 8			
Y Aurigæ	21.5	+42 21	8.6— 9.6	3 20.6	5 17	13 10	21 3	28 20		
RZ Gemin.	5 56.6	+22 15	9.1—10.0	5 12.7	5 4	10 17	21 18	27 7		
RS Orionis	6 16.5	+14 44	8.2— 8.9	7 13.6	2 6	9 20	17 9	24 23		
T Monoc.	19.8	+ 7 08	5.7— 6.8	27 00.3	5 6					
RT Aurigæ	23.0	+30 33	5.1— 6.0	3 17.5	3 10	10 21	18 8	25 19		
W Gemin.	29.2	+15 24	6.7— 7.5	7 22.0	6 18	14 16	22 14	30 12		
ζ Gemin.	6 58.2	+20 43	3.7— 4.3	10 03.7	3 16	13 20	24 0			
RU Camelop.	7 10.9	+69 51	8.5— 9.8	22 06.5		16 22				
RR Gemin.	7 15.2	+31 04	10.0—11.5	0 09.5	6 11	14 10	22 8	30 7		
V Carinae	8 26.7	—59 47	7.4— 8.1	6 16.7	2 11	9 4	22 13	29 6		
T Velorum	8 34.4	—47 01	7.6— 8.5	4 15.3	2 6	11 13	20 19	30		
V Velorum	9 19.2	—55 32	7.5— 8.2	4 08.9	4 12	13 6	21 23	30 18		
Z Leonis	9 46.4	+27 22	7.9— 9.6	56 08.7						
RR Leonis	10 02.1	+24 29	9.1—10.1	0 10.9	2 22	9 17	23 7	30 2		
SU Draconis	11 32.2	+67 53	8.9— 9.6	0 15.8	5 8	11 22	25 3	31 18		
S Muscae	12 07.4	—69 36	6.4— 7.3	9 15.8	8 11	18 2	27 18			
SW Draconis	12.8	+70 04	8.8— 9.6	0 13.7	6 4	14 4	22 3	30 3		
T Crucis	15.9	—61 44	6.8— 7.6	6 17.6	2 13	9 7	22 18	29 12		
R Crucis	18.1	—61 04	6.8— 7.9	5 19.8	2 9	14 0	19 20	31 12		
S Crucis	12 48.4	—57 53	6.5— 7.6	4 16.6	1 23	11 8	20 17	30 2		
W Virginis	13 20.9	— 2 52	8.7—10.4	17 06.5	2 15		19 21			
SS Hydræ	25.0	—23 08	7.4— 8.1	8 04.8	3 17	11 22	20 3	28		
RV Urs. Maj.	13 29.4	+54 31	9.2— 9.9	0 11.2	4 15	11 16	18 16	25 17		
ST Virginis	14 22.5	— 0 27	10.3—11.4	0 09.9	1 3	8 13	23 8	30 18		
V Centauri	25.4	—56 27	6.4— 7.8	5 11.9	1 14	12 14	18 2	29 1		
RS Bootis	29.3	+32 11	8.9—10.0	0 09.1	8 1	15 14	23 4	30 17		
R Triang.Austr.	15 10.8	—66 08	6.7— 7.4	3 09.3	6 20	13 14	20 9	27 4		
S Triang.Austr.	15 52.2	—63 29	6.4— 7.4	6 07.8	4 14	10 22	23 13	29 21		
S Normæ	16 10.6	—57 39	6.6— 7.6	9 18.1	4 21	14 15	24 9			
RW Draconis	33.7	+58 03	9.6—10.8	0 10.6	9 19	18 16	27 12			
RV Scorpii	16 51.8	—33 27	6.7— 7.4	6 01.5	4 15	10 17	22 20	28 21		
X Sagittarii	17 41.3	—27 48	4.4— 5.0	7 00.3	1 10	8 10	22 11	29 11		
Y Ophiuchi	47.3	— 6 07	6.1— 6.5	17 02.9		12 4	29 7			
W Sagittarii	17 58.6	—29 35	4.3— 5.1	7 14.3	1 23	9 13	17 4	24 18		
Y Sagittarii	18 15.5	—18 54	5.4— 6.2	5 18.6	2 20	8 15	20 4	25 23		
U Sagittarii	26.0	—19 12	6.5— 7.3	6 17.9	1 6	8 0	21 11	28 5		
Y Scuti	32.6	— 8 27	8.7— 9.2	10 08.3	6 21	17 5	27 14			
RZ Lyræ	39.9	+32 42	9.9—11.2	0 12.3	1 8	9 0	16 16	24 8		
RT Scuti	18 44.1	—10 30	9.1— 9.7	0 11.9	2 17	10 4	17 14	25 0		
κ Pavonis	18 46.6	—67 22	3.8— 5.2	9 02.2	9 8	18 10	27 12			
U Aquilæ	19 24.0	— 7 15	6.2— 6.9	7 00.6	7 12	14 12	21 13	28 14		

Maxima of Variable Stars of Short Period—Continued.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of maxima in 1925 December							
	h m	° ′		d h	d	h	d	h	d	h	d	h
XZ Cygni	19 30.4	+56 10	8.6— 9.3	0 11.2	7	5	14	5	21	5	28	5
U Vulpec.	32.2	+20 07	6.5 - 7.6	7 23.5	2	0	10	0	17	23	25	23
SU Cygni	40.8	+29 01	6.2— 7.0	3 20.3	1	12	9	5	16	21	24	14
η Aquilæ	47.4	+ 0 45	3.7— 4.5	7 04.2	2	5	9	19	23	17	30	22
S Sagittæ	51.5	+16 22	5.6— 6.4	8 09.2	4	17	13	2	21	11	29	21
X Vulpec.	19 53.3	+26 17	9.5—10.5	6 07.7	6	7	12	15	18	22	25	6
X Cygni	20 39.5	+35 14	6.0— 7.0	16 09.3			10	16	27	1		
T Vulpec.	47.2	+27 52	5.5— 6.1	4 10.5	1	19	10	16	19	13	28	10
UY Cygni	52.3	+30 03	9.6—10.4	0 13.5	1	11	8	5	21	16	28	9
RV Capric.	55.9	—15 37	9.2—10.1	0 10.7	6	13	13	6	19	23	26	16
TX Cygni	20 56.4	+42 12	8.5— 9.7	14 17.4			13	9	28	3		
VY Cygni	21 00.4	+39 34	8.8— 9.5	7 20.6	5	1	12	22	20	19	28	15
SW Aquarii	10.2	— 0 20	9.9—10.8	0 11.0	6	2	12	23	19	21	26	18
VZ Cygni	21 47.7	+42 40	8.2— 9.2	4 20.7	4	14	9	10	19	4	24	0
Y Lacertæ	22 05.2	+50 33	9.1— 9.6	4 07.8	8	15	17	7	25	23		
δ Cephei	25.5	+57 54	3.7— 4.6	5 08.8	5	6	10	15	21	8	26	17
Z Lacertæ	36.9	+56 18	8.2— 9.0	10 21.1	2	19	13	17	24	14		
RR Lacertæ	37.3	+55 55	8.5— 9.2	6 10.1	2	11	8	21	21	17	28	3
V Lacertæ	44.5	+55 48	8.5— 9.5	4 23.6	1	3	11	2	21	2	31	1
X Lacertæ	22 45.0	+55 54	8.2— 8.6	5 10.7	2	17	13	15	19	1	29	22
SW Cassiop.	23 03.7	+58 11	9.2— 9.7	5 10.6	5	0	10	11	21	8	26	19
RS Cassiop	32.6	+61 52	9.0—11.0	6 07.1	1	9	7	16	20	6	26	13
RY Cassiop.	47.2	+58 11	9.3—11.8	12 03.4	5	19	17	23	30	2		
V Cephei	23 51.7	+82 38	6.0— 7.0	0 23.9	7	5	14	5	21	5	28	4

Monthly Report of the American Association of Variable Star Observers, September, 1925.

The volume and source of our report for the past month indicate considerable renewed activity on the part of many of our observers. Messrs. Ball and Southworth—whose observations are indicated by BS—contribute their first joint report. Messrs. Ikeda and Hama from Japan have been heard from after a long interval, and Mr. Bunch has sent a list from Texas. The recent AAVSO meeting at Yerkes has already proved productive in the receipt of more observations from our hitherto infrequent mid-western members.

The Association has been requested to coöperate in the international observing project outlined by the sub-committee on Variable Stars of the I. A. U., of which our worthy secretary, Mr. Olcott, was a member. In this scheme certain variable stars, mainly of the irregular type and needing more systematic and frequent observations, have been allotted to the several variable star organizations, and the AAVSO has been asked to assume responsibility for securing observations of the stars on the following list, some of which are already being observed by a few of our more experienced members.

005840 RX Andromedae	010884 RU Cephei	024136 TX Persei
041619 T Tauri	*053005a* T Orionis	054319 SU Tauri
081473 Z Camelopardalis	090151 V Ursae Majoris	094512 X Leonis
114003 TW Virginis	*173411* RT Serpentis	200916 R Sagittae
213937 RV Cygni	220912 RU Pegasi	

Charts for these will be prepared at an early date and then we hope that our members, especially those of wide experience and possessing large instruments, will enter fully into this valuable, coöperative scheme.

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925.

July 0 = J. D. 2424332 August 0 = J. D. 2424363 September 0 = J. D. 2424394

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
000339 V SCULPTORIS—						
	4351.8	10.9	Bl	4362.9	10.7	Bl
001032 S SCULPTORIS—						
	4349.9	11.3	Ht	4362.6	10.6	Bl
	4349.9	11.6	Sm	4386.3	9.3	Pt
	4351.8	10.8	Bl			
001046 X ANDROMEDAE—						
	4365.4	9.2	Cu	4389.3	9.1	Wf
	4381.3	8.8	Wf	4393.3	8.9	Cu
	4384.3	9.2	Bi			
001620 T CETI—						
	4352.0	5.5	An	4382.0	5.4	An
	4372.1	5.4	An	4384.7	6.3	Kd
	4374.1	5.4	L	4390.6	6.2	Kd
	4374.7	6.0	Kd	4392.0	5.4	An
	4381.6	6.5	Kd			
001726 T ANDROMEDAE—						
	4345.8	[10.7	Ch	4385 2	9.5	Jo
	4372.9	10.6	Ch	4386.3	9.3	Pt
	4379.3	9.3	Br	4388.2	9.3	Jo
	4382.7	9.3	Ch	4400.2	8.9	Cu
	4384.3	9.1	Bi			
001755 T CASSIOPEIAE—						
	4373.0	11.0	L	4389.1	9.2	Jo
	4385.2	9.5	Jo	4392.1	10.7	Cm
	4386.2	9.5	Jo	4403.0	10.7	Du
	4386.3	9.6	Pt	4403.1	9.0	Jo
	4388.2	9.0	Jo	4413.2	9.0	Jo
001838 R ANDROMEDAE—						
	4345.8	9.2	Ch	4386.3	10.6	Pt
	4351.6	9.6	Kk	4387.1	10.2	Jo
	4356.6	9.7	Kk	4389.3	9.2	Wf
	4373.7	10.2	Ch	4391.9	9.9	Lp
	4375.5	10.1	Kk	4394.3	10.3	Wf
	4381.3	9.9	Wf	4406.3	11.1	Wf
	4383.6	10.0	Kk	4408.2	11.0	Gb
	4383.8	9.7	Bh	4411.2	11.0	Mb
	4385.2	10.1	Jo			
001862 S TUCANAE—						
	4349.8	8.4	Sm	4362.6	9.2	Bl
001909 S CETI—						
	4334.9	10.4	Ch	4382.1	8.9	An
	4374.1	8.8	L	4386.3	9.1	Pt
	4380.7	8.6	Ch	4392.1	9.2	An
002516 T PHOENICIS—						
	4349.9	[12.2	Sm	4351.8	[13.6	Bl
002833 W SCULPTORIS—						
	4351.8	13.2	Bl			
003179 Y CEPHEI—						
	4393.2	14.0	Br			
004047 U CASSIOPEIAE—						
	4381.3	9.9	Wf	4393.3	9.7	Br
	4384.	9.2	Bi	4400.2	8.6	Cu
	4386.3	9.0	Pt	4406.3	8.8	Wf
	4389.3	9.2	Wf			
004132 RW ANDROMEDAE—						
	4379.4	[13.7	Br	4393.3	[13.7	Br
	4380.7	[11.0	Ch	4407.3	[13.7	Br
004435 V ANDROMEDAE—						
	4379.4	12.0	Br	4393.3	11.6	Br
	4384.3	11.6	Bi			
004435 X SCULPTORIS—						
	4362.6	[13.6	Bl			
004533 RR ANDROMEDAE—						
	4379.4	9.3	Br	4389 3	8.2	Wf
	4381.3	8.2	Wf	4406.3	8.3	Wf
004746a RV CASSIOPEIAE—						
	4381.3	8.2	Wf	4404.1	8.2	Du
	4386.3	8.2	Pt	4406.3	8.3	Wf
	4389.3	8.2	Wf			
004746b — CASSIOPEIAE—						
	4381.3	10.9	Wf	4389.3	10.9	Wf
	4386.3	10.8	Pt	4406.3	10.8	Wf
004958 W CASSIOPEIAE—						
	4386.3	8.9	Pt	4404.1	9.2	Du
	4389.1	9.2	Cg	4408.1	8.7	B
005475 U TUCANAE—						
	4341.8	8.2	Sm	4360.8	9.5	Sm
	4349.8	8.9	Sm	4362.6	9.3	Bl
005840 RX ANDROMEDAE—						
	4379.3	13.6	Br	4392.2	[12.6	Pt
	4381.2	[12.6	Pt	4393.2	13.3	Br
	4383.2	[12.6	Pt	4393.3	13.3	Cu
	4384.2	[11.7	Pt	4395.2	[11.3	Pt
	4385.2	11.5	Pt	4398.2	[12.6	Pt
	4386.2	11.3	Pt	4407.2	10.5	Br
	4387.2	11.2	Pt	4409.2	[11.3	Pt
	4388.2	11.5	Pt	4411.2	[10.9	Pt
	4390.2	12.0	Pt	4412.2	[10.9	Pt
	4392.2	12.7	Br			
010102 Z CETI—						
	4386.3	13.4	Pt			
010630 U SCULPTORIS—						
	4362.6	11.5	Bl			
010940 U ANDROMEDAE—						
	4379.4	13.4	Br	4406.3	14.1	Wf
	4381.3	13.5	Wf	4407.3	13.6	Br
	4389.3	13.7	Wf			
011041 UZ ANDROMEDAE—						
	4379.3	12.8	Br	4389.3	11.7	Wf
	4381.4	12.6	Wf	4393.3	11.0	Br
	4386.2	12.0	Wf	4406.3	10.5	Wf
011208 S PISCIUM—						
	4379.4	[13.5	Br			
011272 S CASSIOPEIAE—						
	4381.4	11.2	Wf	4394.3	11.1	Wf
	4384.3	10.8	Bi	4404.1	11.7	Du
	4386.3	11.2	Pt	4406.3	11.2	Wf
	4389.4	11.5	Wf			
011712 U PISCIUM—						
	4379.4	12.0	Br	4386.3	11.9	Pt
012233a R SCULPTORIS—						
	4384.7	8.6	Kd			
012350 RZ PERSEI—						
	4393.3	13.5	Br			

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
012502 R PISCIUM—						
	4379.4	11.5	Br	4385.7	[10.3	Ch
	4385.4	13.3	Bi	4386.2	12.6	Cu
013238 RU ANDROMEDAE—						
	4379.9	[10.3	Ch	4389.4	13.4	Wf
	4381.4	13.5	Wf	4393.3	13.7	Br
	4386.3	13.6	Pt	4406.3	14.4	Wf
013338 Y ANDROMEDAE—						
	4379.7	[10.3	Ch	4393.3	12.8	Br
	4386.3	11.9	Pt	4407.3	13.4	Br
014958 X CASSIOPEIAE—						
	4386.3	12.0	Pt			
015354 U PERSEI—						
	4386.3	8.4	Pt	4400.2	8.4	Cu
015912 S ARIETIS—						
	4386.3	12.1	Pt			
021024 R ARIETIS—						
	4379.4	11.0	Br	4389.4	11.4	Wf
	4381.4	10.5	Wf	4391.3	11.5	Wf
	4383.3	11.3	Wf	4393.3	11.5	Br
	4385.4	11.3	Bi	4406.4	12.2	Wf
	4386.3	11.4	Pt	4407.3	12.2	Br
021143a W ANDROMEDAE—						
	4381.4	13.5	Wf	4393.4	13.5	Br
	4386.3	13.0	Pt	4394.4	13.2	Wf
	4389.4	13.4	Wf	4407.3	12.6	Wf
021258 T PERSEI—						
	4380.7	8.9	Ch	4386.3	8.4	Pt
021281 Z CEPHEI—						
	4381.4	14.1	Wf	4393.2	14.2	Br
	4391.3	14.4	Wf	4407.3	14.8	Wf
021403 o CETI—						
	4334.9	9.0	Ch	4389.4	9.1	Wf
	4352.0	9.3	An	4392.1	9.1	An
	4362.1	9.2	An	4393.3	8.6	Cu
	4374.1	8.7	L	4393.4	8.9	Wf
	4378.9	9.1	Ch	4400.3	8.3	Cu
	4381.4	9.1	Wf	4406.4	8.6	Wf
	4382.1	9.2	An	4407.4	8.5	Wf
	4386.3	8.6	Pt	4412.2	8.1	Pt
021558 S PERSEI—						
	4374.9	11.0	Kl	4387.1	11.0	Cu
	4380.7	11.2	Ch	4389.9	10.9	Kl
	4382.9	10.7	Kl	4397.8	10.6	Kl
	4386.2	10.8	Cu	4400.3	10.6	Cu
	4386.2	10.5	Pt	4402.8	10.6	Kl
022000 R CETI—						
	4334.9	[10.2	Ch	4379.4	7.9	Br
022150 RR PERSEI—						
	4381.4	13.3	Wf	4393.2	11.7	Br
	4386.2	13.5	Pt	4407.2	14.2	Wf
	4391.3	13.3	Wf			
022426 R FORNACIS—						
	4362.6	12.3	Bl			
022813 U CETI—						
	4386.2	9.9	Pt			
022980 RR CEPHEI—						
	4381.4	13.3	Wf	4393.2	11.7	Br
	4386.3	11.5	Pt	4407.3	10.6	Wf
	4391.3	11.8	Wf			
023133 R TRIANGULI—						
	4385.4	6.1	Bi	4388.2	6.4	Jo
	4386.2	6.5	Jo	4400.2	6.0	Cu
	4386.3	6.3	Pt	4403.2	5.3	Jo
024356 W PERSEI—						
	4386.3	9.0	Pt	4392.1	9.3	Cm
025050 R HOROLOGII—						
	4362.7	12.1	Bl			
025751 T HOROLOGII—						
	4362.7	8.6	Bl			
030514 U ARIETIS—						
	4379.4	10.2	Br	4393.4	11.5	Br
	4386.4	11.1	Cu			
031401 X CETI—						
	4374.1	8.9	L	4386.4	10.1	Cu
	4381.4	9.5	Wf	4393.5	10.5	Wf
	4386.3	10.0	Pt	4407.3	11.8	Wf
032043 Y PERSEI—						
	4386.3	10.2	Pt	4404.2	10.0	Gb
032335 R PERSEI—						
	4379.4	8.8	Br	4391.9	9.0	Lp
	4381.3	9.3	Wf	4394.3	9.6	Wf
	4386.3	9.4	Pt	4406.9	11.0	Lp
	4389.4	9.5	Wf	4407.3	10.7	Wf
032443 NOVA PERSEI NO. 3—						
	4393.4	14.1	Cu			
042209 R TAURI—						
	4386.3	12.8	Pt	4393.4	13.5	Br
042215 W TAURI—						
	4386.3	9.9	Pt			
042309 S TAURI—						
	4386.3	11.3	Pt	4393.3	11.3	Cu
043065 T CAMELOPARDALIS—						
	4376.9	8.1	L	4387.1	8.8	Mh
	4386.3	8.4	Pt	4393.4	8.7	Br
043208 RX TAURI—						
	4393.5	14.0	Br			
043263 R RETICULI—						
	4362.7	11.6	Bl			
043274 X CAMELOPARDALIS—						
	4386.3	8.5	Pt	4393.4	8.8	Br
043562 R DORADUS—						
	4342.4	6.0	Bl	4362.7	5.8	Bl
043738 R CAELI—						
	4362.7	10.1	Bl			
044349 R PICTORIS—						
	4362.7	7.9	Bl			
044617 V TAURI—						
	4381.4	10.8	Wf	4393.4	9.9	Wf
	4382.4	10.6	Wf	4393.4	10.2	Br
	4386.3	10.6	Pt	4406.4	10.4	Wf
	4389.4	10.6	Wf	4407.4	9.9	Wf
045307 R ORIONIS—						
	4393.5	9.5	Br			
045514 R LEPORIS—						
	4374.1	8.8	L	4391.9	8.8	Bh
	4386.3	9.9	Pt			
050003 V ORIONIS—						
	4386.3	9.0	Pt			
050022 T LEPORIS—						
	4362.7	12.5	Bl			

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
050848 S PICTORIS—						
	4362.7	11.7	Bl			
050953 R AURIGAE—						
	4379.4	8.8	Br	4386.4	8.9	Cu
	4381.4	8.4	Wf	4390.3	9.1	Wf
	4385.4	8.7	Bi	4394.3	9.4	Wf
	4386.3	8.9	Pt	4407.4	9.3	Wf
051247 T PICTORIS—						
	4362.7	12.1	Bl			
051533 T COLUMBAE—						
	4362.7	8.1	Bl	4391.9	8.8	Bh
052036 W AURIGAE—						
	4379.5	[14.2	Br	4407.4	[13.8	Br
	4393.4	[14.8	Br			
052401 S ORIONIS—						
	4386.3	12.6	Pt	4414.4	12.4	Pt
053005a T ORIONIS—						
	4381.1	10.0	L	4392.1	9.9	An
	4386.3	9.9	Pt			
052068 S CAMELOPARDALIS—						
	4386.3	8.3	Pt			
053337 RU AURIGAE—						
	4379.5	11.0	Br	4414.4	11.8	Pt
	4386.3	11.0	Pt			
053531 Y AURIGAE—						
	4386.3	10.3	Pt	4393.5	10.1	Br
054319 SU TAURI—						
	4363.9	9.8	Ch	4389.4	9.6	Wf
	4376.1	9.7	L	4393.5	9.7	Wf
	4379.5	9.6	Br	4393.5	9.5	Br
	4382.4	9.6	Wf	4397.2	9.6	Pt
	4385.4	9.5	Bi	4400.3	9.5	Cu
	4386.3	9.5	Cu	4407.4	9.5	Wf
	4386.3	9.5	Pt			
054331 S COLUMBAE—						
	4362.7	12.5	Bl			
054615a Z TAURI—						
	4393.5	13.5	Br			
054615c RU TAURI—						
	4393.5	10.7	Br			
054629 R COLUMBAE—						
	4362.7	11.8	Bl			
054920a U ORIONIS—						
	4363.9	10.2	Ch	4386.3	7.7	Pt
	4385.4	7.8	Bi			
054920b UW ORIONIS—						
	4385.4	10.8	Bi			
054974 V CAMELOPARDALIS—						
	4381.4	[14.2	Wf	4406.2	15.2	Wf
	4382.4	[15.0	Wf	4407.4	15.4	Wf
	4393.5	15.3	Wf			
055353 Z AURIGAE—						
	4381.2	10.3	Cu	4391.3	10.7	Wf
	4381.4	10.1	Wf	4392.2	10.5	Pt
	4382.4	10.1	Wf	4394.3	10.8	Wf
	4383.2	11.0	Pt	4395.2	10.0	Pt
	4383.3	10.3	Wf	4397.2	10.0	Pt
	4386.3	10.6	Cu	4407.4	11.2	Wf
	4386.3	11.0	Pt	4411.2	10.2	Pt
055686 R OCTANTIS—						
	4342.4	12.2	Bl	4349.8	[11.6	Br
060450 X AURIGAE—						
	4386.3	9.0	Pt			
060547 SS AURIGAE—						
	4373.9	[11.6	Ch	4386.3	[12.6	Pt
	4374.1	[11.0	L	4389.4	[13.9	Wf
	4375.1	10.9	L	4390.3	[14.5	Wf
	4376.1	10.7	L	4391.3	[13.9	Wf
	4379.4	12.4	Br	4392.2	[11.0	Pt
	4381.1	13.6	L	4393.5	15.2	Wf
	4381.2	[11.0	Cu	4394.3	[13.0	Wf
	4381.3	13.8	Wf	4395.2	[11.0	Pt
	4381.4	13.8	Wf	4397.2	[11.5	Pt
	4382.4	14.6	Wf	4406.3	15.6	Wf
	4383.2	[12.0	Pt	4407.3	15.6	Wf
	4385.3	[13.9	Wf	4412.2	[12.6	Pt
	4385.4	[13.3	Bi			
061702 V MONOCEROTIS—						
	4414.4	13.0	Pt			
063308 R MONOCEROTIS—						
	4386.3	10.5	Pt			
063462 NOVA PICTORIS—						
	4333.7	3.5	Sm	4348.8	3.3	Sm
	4334.7	3.5	Sm	4349.7	3.0	Sm
	4335.4	3.6	Bl	4350.7	2.9	Sm
	4335.7	3.5	Sm	4356.7	2.2	Sm
	4338.7	3.3	Sm	4360.7	2.2	Sm
	4339.7	3.3	Sm	4361.5	2.3	Bl
	4340.7	3.4	Sm	4361.7	2.2	Sm
	4341.7	2.8	Sm	4362.4	2.7	Bl
	4342.4	3.0	Bl	4362.7	2.7	Bl
	4343.4	3.0	Bl	4362.7	2.9	Sm
	4343.8	3.0	Sm	4363.0	3.2	Sm
	4346.4	3.0	Bl	4363.7	3.2	Sm
	4347.7	3.3	Sm			
063558 S LYNCIS—						
	4386.3	14.2	Pt	4407.4	13.0	Br
064707 W MONOCEROTIS—						
	4414.4	10.8	Pt			
065355 R LYNCIS—						
	4381.4	8.2	Wf	4407.4	9.2	Wf
	4390.3	9.0	Wf	4407.4	9.2	Br
	4394.3	8.7	Wf			
070122a R GEMINORUM—						
	4382.5	11.7	Wf	4407.4	9.9	Wf
	4393.5	11.4	Wf			
070122b Z GEMINORUM—						
	4386.3	7.8	Pt			
070122c TW GEMINORUM—						
	4386.3	12.4	Pt			
070772 R VOLANTIS—						
	4339.7	[12.6	Ht	4349.8	[12.6	Sm
071713 V GEMINORUM—						
	4414.4	13.6	Pt			
072708 S CANIS MINORIS—						
	4414.4	12.5	Pt			
072811 T CANIS MINORIS—						
	4414.4	11.7	Pt			
073173 S VOLANTIS—						
	4342.4	[13.2	Bl			
073508 U CANIS MINORIS—						
	4414.4	12.3	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
074241 W PUPPIS—						
	4341.7	9.4	Sm	4342.4	9.0	Bl
074922 U GEMINORUM—						
	4393.5	13.9	Wf	4407.4	[13.7	Wf
081112 R CANCRI—						
	4414.4	11.2	Pt			
081617 V CANCRI—						
	4414.4	8.0	Pt			
082476b R CHAMAELEONTIS—						
	4341.7	8.5	Sm	4360.8	9.5	Sm
	4342.4	8.7	Bl	4361.5	9.5	Bl
	4349.7	9.0	Sm			
084803 S HYDRAE—						
	4414.4	9.0	Pt			
085120 T CANCRI—						
	4414.4	9.0	Pt			
091868 RW CARINAE—						
	4346.4	12.4	Bl			
092551 Y VELORUM—						
	4342.4	12.8	Bl	4346.4	12.7	Bl
092962 R CARINAE—						
	4333.7	8.4	Sm	4349.7	8.1	Ht
	4339.7	8.5	Ht	4349.7	8.2	Sm
	4341.8	8.4	Sm	4360.7	7.6	Sm
	4342.4	8.0	Bl	4361.5	7.0	Bl
093934 R LEONIS MINORIS—						
	4334.6	9.8	Ch			
094211 R LEONIS—						
	4256.9	6.2	An	4282.5	6.9	H
	4260.5	6.4	H	4300.6	6.6	H
	4265.5	6.5	H	4334.6	7.8	Ch
	4267.4	6.5	H	4414.4	9.5	Pt
	4272.5	6.5	H			
094953 Z VELORUM—						
	4339.7	[12.1	Ht	4349.7	[12.1	Sm
	4346.4	[12.8	Bl			
095421 V LEONIS—						
	4414.4	10.1	Pt			
095563 RV CARINAE—						
	4346.4	[13.1	Bl			
100661 S CARINAE—						
	4333.7	6.0	Sm	4349.7	6.5	Ht
	4339.7	6.2	Ht	4349.7	6.5	Sm
	4341.8	6.0	Sm	4361.5	6.7	Bl
	4342.4	5.7	Bl	4360.7	6.8	Sm
101058 Z CARINAE—						
	4346.4	[12.6	Bl			
101153 W VELORUM—						
	4346.4	[13.0	Bl	4349.8	[12.0	Sm
103769 R URSAE MAJORIS—						
	4381.2	11.9	Pt	4392.2	12.0	Br
	4381.2	12.3	Wf	4393.2	12.0	Wf
	4387.1	11.5	Al	4406.1	11.7	Wf
	4389.2	12.1	Wf	4414.4	11.0	Pt
104620 V HYDRAE—						
	4342.4	10.9	Bl			
104638 RS HYDRAE—						
	4342.4	9.8	Bl			
110361 RS CARINAE—						
	4341.8	[12.3	Sm	4349.7	[12.3	Sm
111561 RY CARINAE—						
	4346.4	[13.1	Bl			
111661 RS CENTAURI—						
	4341.8	10.5	Sm	4360.7	9.5	Sm
	4346.4	11.6	Bl	4361.5	8.9	Bl
	4349.7	9.3	Sm			
114441 X CENTAURI—						
	4342.4	7.3	Bl	4361.5	7.9	Bl
115058 W CENTAURI—						
	4346.4	13.1	Bl			
122532 T CANUM VENATICORUM—						
	4381.2	10.1	Pt			
122854 U CENTAURI—						
	4342.4	8.9	Bl	4361.5	10.1	Bl
123160 T URSAE MAJORIS—						
	4339.9	7.2	Ch	4387.1	9.0	Su
	4345.5	8.0	Ik	4387.7	9.0	Bh
	4349.5	7.9	Ik	4388.1	8.6	Jo
	4351.5	8.0	Ik	4388.1	8.9	Al
	4353.5	8.1	Ik	4389.1	8.8	Jo
	4353.6	7.9	Ch	4389.2	8.5	Wf
	4356.6	8.1	Ik	4389.9	9.0	Kl
	4356.6	7.9	Kk	4391.1	9.0	Ly
	4357.5	8.1	Ik	4392.1	9.0	Cm
	4360.6	8.2	Ik	4392.1	9.1	Jo
	4371.6	8.3	Ch	4393.3	8.9	Wf
	4375.9	8.3	Kl	4397.1	9.5	Ks
	4381.2	8.6	Pt	4397.8	9.4	Kl
	4381.2	8.2	Wf	4398.2	9.5	Ly
	4382.1	8.6	Ly	4402.1	9.7	Ly
	4385.1	9.1	Mh	4402.8	9.7	Kl
	4385.1	8.4	Jo	4406.2	9.9	Wf
	4386.1	8.9	Ly	4406.9	10.4	Lp
123307 R VIRGINIS—						
	4371.3	6.9	L	4385.6	6.5	Ch
123459 RS URSAE MAJORIS—						
	4381.2	14.4	Wf	4389.2	[13.7	Wf
	4381.2	14.0	Pt	4406.2	14.2	Wf
123961 T URSAE MAJORIS—						
	4339.7	9.9	Ch	4381.2	11.4	Wf
	4345.9	10.0	An	4384.9	11.2	Kl
	4353.6	10.9	Ch	4387.1	11.5	Su
	4353.9	10.2	An	4389.2	11.2	Wf
	4360.9	10.9	An	4397.8	11.0	Kl
	4370.8	11.0	An	4402.8	11.0	Kl
	4371.6	11.3	Ch	4406.2	10.6	Wf
	4373.0	11.0	L	4406.9	10.8	Lp
	4381.2	11.4	Pt			
131283 U OCTANTIS—						
	4341.8	8.6	Sm	4360.8	9.6	Sm
	4342.4	8.5	Bl	4361.5	9.6	Bl
	4349.8	9.0	Sm			
132422 R HYDRAE—						
	4334.6	5.9	Ch	4361.5	5.8	Bl
	4342.4	5.8	Bl	4364.6	6.2	Ch
	4353.6	6.2	Ch	4371.5	7.5	Kd
	4360.8	6.1	Sm	4380.6	6.5	Ch

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
132706 S VIRGINIS—						
	4334.6	8.4	Ch	4360.8	8.7	Sm
	4341.8	8.4	Sm	4364.6	9.3	Ch
	4352.6	9.1	Ch	4380.6	9.9	Ch
	4349.8	8.5	Sm			
133155 RY CENTAURI—						
	4342.4	8.2	Bl	4361.5	7.7	Bl
133273 T URSAE MINORIS—						
	4381.2	14.6	Wf	4398.2	13.5	Br
	4389.2	14.8	Wf	4406.2	14.6	Wf
133633 T CENTAURI—						
	4339.8	6.5	Ht	4348.7	6.9	Ht
	4342.4	6.5	Bl	4361.5	7.3	Bl
134236 RT CENTAURI—						
	4346.4	13.2	Bl			
134440 R CANUM VENATICORUM—						
	4381.2	9.7	Pt	4393.0	9.3	Cu
	4384.1	9.8	Ly	4398.1	9.0	Ly
	4385.1	9.6	Mh	4402.1	9.5	Ly
	4391.9	9.6	Lp			
134536 RX CENTAURI—						
	4342.4	10.5	Bl	4361.5	9.7	Bl
	4346.4	10.5	Bl			
134677 T APODIS—						
	4341.8	11.7	Sm	4359.5	8.1	Bl
	4342.4	11.2	Bl	4360.8	9.0	Sm
	4349.8	10.6	Sm			
140113 Z BOOTIS—						
	4381.2	[14.0	Wf	4407.2	14.6	Wf
	4382.2	[14.4	Wf			
140528 RU HYDRAE—						
	4342.4	12.9	Bl	4349.9	[12.5	Sm
140959 R CENTAURI—						
	4339.7	7.6	Ht	4349.8	7.8	Sm
	4342.4	7.3	Bl	4361.5	7.6	Bl
	4349.7	8.1	Ht	4363.7	8.3	Sm
141567 W URSAE MINORIS—						
	4348.7	[11.0	Ch	4387.1	10.5	Bi
	4371.6	[11.0	Ch	4389.1	10.9	Cg
	4381.2	11.2	Pt	4397.1	9.8	Bi
141954 S BOOTIS—						
	4339.7	9.0	Ch	4385.6	9.0	Ch
	4354.7	8.9	Ch	4388.1	8.6	Jo
	4373.0	8.2	L	4389.2	8.5	Wf
	4381.2	8.3	Wf	4393.3	8.5	Wf
	4381.2	8.8	Pt	4403.1	9.0	Jo
	4385.1	8.5	Jo	4406.2	9.0	Wf
142539a V BOOTIS—						
	4345.7	10.3	Ch	4388.1	8.8	Jo
	4376.9	9.1	L	4391.9	8.8	Lp
	4381.2	9.0	Pt	4398.1	8.5	Ly
	4382.1	9.6	Ly	4402.1	8.7	Ly
	4385.1	9.1	Mh	4403.0	8.0	Cu
	4385.6	8.9	Ch	4406.9	8.3	Lp
	4386.1	8.7	Jo	4408.2	8.0	Gb
	4387.1	9.2	Al	4415.1	8.4	Su
	4388.1	9.2	Ly			
142584 R CAMELOPARDALIS—						
	4381.2	10.6	Br	4393.3	11.6	Wf
	4381.3	11.2	Wf	4398.0	11.7	Du
142584 R CAMELOPARDALIS—Continued.						
	4389.2	11.3	Wf	4409.0	12.1	Du
	4393.2	11.5	Br	4406.2	12.6	Wf
143227 R BOOTIS—						
	4345.7	8.5	Ch	4385.6	7.8	Ch
	4381.2	6.8	Pt	4408.2	7.4	Gb
	4383.7	6.9	Bh	4415.1	8.5	Su
	4385.1	7.2	Mh			
144918 U BOOTIS—						
	4393.4	11.7	Cu	4403.0	11.6	Cu
145254 Y LUPI—						
	4342.5	11.5	Bl	4361.6	12.3	Bl
145971 S APODIS—						
	4342.5	10.0	Bl	4360.8	10.4	Sm
	4349.8	10.4	Sm	4361.6	9.5	Bl
150018 RT LIBRAE—						
	4381.2	9.5	Pt			
151520 S LIBRAE—						
	4370.6	9.2	Ch	4371.8	9.2	L
151714 S SERPENTIS—						
	4376.9	9.5	L	4391.2	8.5	Wf
	4381.2	9.6	Wf	4406.2	8.8	Wf
	4381.2	9.5	Pt			
151731 S CORONAE BOREALIS—						
	4381.2	12.0	Pt	4389.2	12.4	Wf
	4381.3	12.6	Wf	4392.3	12.5	Wf
	4388.1	12.5	Cu	4406.2	12.2	Wf
151822 RS LIBRAE—						
	4339.7	9.8	Ht	4349.7	10.6	Sm
	4341.7	10.4	Sm	4361.6	11.0	Bl
	4342.4	9.8	Bl	4371.8	11.6	L
	4349.7	11.9	Ht			
152714 RU LIBRAE—						
	4381.2	12.3	Pt			
152849 R NORMAE—						
	4341.7	9.4	Sm	4349.9	9.9	Sm
	4342.5	10.0	Bl	4361.6	8.8	Bl
153020 X LIBRAE—						
	4342.4	10.8	Bl	4361.6	11.0	Bl
153215 W LIBRAE—						
	4346.4	[13.1	Bl			
153378 S URSAE MINORIS—						
	4381.3	12.5	Wf	4400.1	12.4	Du
	4385.1	[10.8	Mh	4403.0	12.4	Du
	4387.7	[9.2	Bh	4406.2	12.5	Wf
	4389.2	12.5	Wf	4408.8	10.5	Ro
	4392.3	12.6	Wf			
153620a U LIBRAE—						
	4346.4	12.4	Bl	4361.6	11.0	Bl
153654 T NORMAE—						
	4339.7	12.8	Ht	4349.7	[12.8	Ht
154020 Z LIBRAE—						
	4346.4	[12.7	Bl			
154428 R CORONAE BOREALIS—						
	4344.6	6.1	Ch	4387.1	5.8	Jo
	4345.9	6.3	An	4387.7	6.0	Bh
	4348.7	6.1	Ch	4388.1	6.1	Ly
	4353.8	6.2	An	4388.1	6.2	Al
	4354.9	6.0	An	4388.1	6.1	Su
	4355.7	5.8	Ch	4388.2	6.1	Pt
	4356.9	6.3	An	4389.0	6.5	Cg

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
154428 R CORONAE BOREALIS—Continued.						
	4363.6	5.9	Ch	4389.0	6.0	Du
	4370.8	6.3	An	4389.1	6.0	Ks
	4371.1	5.9	Cu	4389.2	6.1	Wf
	4371.5	6.0	Kd	4389.9	5.8	Kl
	4371.6	5.8	Ch	4389.9	6.1	An
	4372.1	6.0	Cu	4390.0	6.0	Du
	4373.9	6.4	An	4390.1	6.2	Ly
	4374.5	6.0	Kd	4390.2	6.2	Pt
	4374.6	5.8	Mm	4390.3	6.0	Wf
	4375.9	6.3	Kl	4391.1	6.1	Du
	4376.9	6.0	L	4391.1	6.0	Ly
	4376.9	6.0	An	4391.2	6.2	Pt
	4377.8	6.0	L	4392.1	6.1	Cu
	4379.7	5.9	Ch	4392.1	6.1	Cm
	4381.1	6.0	Du	4393.2	6.2	Pt
	4381.2	6.1	Pt	4393.3	6.0	Wf
	4381.3	6.1	Wf	4394.2	6.1	Pt
	4381.5	6.0	Kd	4396.2	6.2	Pt
	4381.9	6.3	An	4396.7	6.4	Bh
	4382.9	5.8	Kl	4397.1	5.9	Ks
	4383.1	6.1	BS	4398.1	6.0	Ly
	4383.2	6.2	Pt	4398.1	6.1	Du
	4383.3	6.2	Wf	4398.2	6.2	Pt
	4383.7	5.9	Bh	4398.7	5.8	Bh
	4383.8	6.0	L	4399.1	6.2	Al
	4384.1	6.0	Ly	4400.1	6.1	Du
	4384.2	6.1	Pt	4401.2	6.2	Pt
	4384.9	6.1	An	4402.1	6.0	Ly
	4385.1	6.0	Jo	4403.1	6.1	Du
	4385.1	6.6	Mh	4404.1	6.1	Du
	4385.2	6.2	Pt	4404.2	6.2	Pt
	4385.6	5.9	Ch	4406.2	6.0	Wf
	4385.7	5.8	Bh	4407.2	6.2	Pt
	4386.1	5.8	Cu	4408.2	6.5	Gb
	4386.2	6.1	Pt	4409.2	6.2	Pt
	4386.6	6.0	Kd	4411.2	6.2	Pt
	4387.1	6.0	Cu	4412.2	6.2	Pt
	4387.1	6.0	BS	4413.2	6.2	Pt
	4387.2	6.1	Pt			
154536 X CORONAE BOREALIS—						
	4381.3	9.8	Wf	4400.0	9.2	Cu
	4384.2	9.3	Pt	4406.2	9.2	Wf
	4391.3	9.6	Wf			
154639 V CORONAE BOREALIS—						
	4301.6	9.8	Kk	4391.2	7.9	Wf
	4381.3	7.9	Wf	4398.1	7.0	B
	4384.2	12.6	Pt	4406.2	7.6	Wf
	4384.2	7.0	Pt	4414.0	7.2	Ya
155018 RR LIBRAE—						
	4345.7	8.6	Ch	4380.6	8.4	Ch
	4370.6	8.4	Ch	4384.2	8.6	Pt
	4371.9	8.6	L			
155229 Z CORONAE BOREALIS—						
	4398.1	12.8	B			
155823 RZ SCORPII—						
	4339.7	[12.2	Ht	4349.7	[12.2	Sm
	4341.7	[12.0	Sm			
160021 Z SCORPII—						
	4341.7	11.5	Sm	4349.7	10.9	Sm
	4342.5	11.1	Bl	4361.6	10.4	Bl
160118 R HERCULIS—						
	4372.7	[10.3	Ch	4382.1	12.8	Cu
	4374.6	[12.0	Mm			
160221a X SCORPII—						
	4342.5	11.4	Bl	4361.6	[12.8	Bl
160325 SX HERCULIS—						
	4376.9	8.1	L	4393.2	9.2	Pt
	4381.2	8.2	Pt	4393.3	8.9	Wf
	4381.3	8.5	Wf	4394.2	9.2	Pt
	4383.2	8.1	Pt	4396.2	9.1	Pt
	4383.3	8.3	Wf	4398.2	9.1	Pt
	4384.2	8.1	Pt	4401.2	9.2	Pt
	4386.2	8.6	Pt	4406.2	9.2	Wf
	4387.2	8.5	Pt	4407.2	9.4	Pt
	4388.2	8.5	Pt	4409.2	9.5	Pt
	4389.2	8.7	Wf	4411.2	9.5	Pt
	4390.2	8.8	Pt	4413.2	9.5	Pt
	4391.2	9.0	Pt	4413.4	9.4	Pt
	4391.2	9.0	Wf			
160519 W SCORPII—						
	4342.5	11.8	Bl	4361.6	11.6	Bl
160625 RU HERCULIS—						
	4377.9	12.8	L	4389.2	12.7	Wf
	4381.3	12.8	Wf	4406.2	12.7	Wf
	4384.2	12.6	Pt			
161122a R SCORPII—						
	4341.7	10.2	Sm	4361.6	10.9	Bl
	4342.5	9.4	Bl	4384.2	12.6	Pt
	4349.7	10.7	Sm			
161122b S SCORPII—						
	4342.5	13.0	Bl	4384.2	10.8	Pt
	4361.6	12.0	Bl			
161138 W CORONAE BOREALIS—						
	4381.3	10.2	Wf	4393.3	9.3	Wf
	4382.1	9.8	Cu	4398.1	9.3	B
	4384.2	9.8	Pt	4406.2	9.2	Wf
	4389.2	9.5	Wf	4415.0	9.2	Ya
161607 W OPHIUCHI—						
	4372.7	[11.0	Ch	4384.2	12.3	Pt
162112 V OPHIUCHI—						
	4384.2	9.0	Pt	4415.0	9.9	Ya
162119 U HERCULIS—						
	4348.7	8.9	Ch	4387.1	9.4	Jo
	4353.9	9.0	Kl	4387.1	9.7	Cm
	4364.9	9.4	Kl	4388.1	9.6	Jo
	4368.9	9.5	Kl	4389.1	9.7	Jo
	4372.7	9.6	Ch	4389.2	9.8	Wf
	4374.9	9.8	Kl	4389.9	10.0	Kl
	4381.2	9.7	Wf	4391.8	10.0	Kl
	4382.9	9.8	Kl	4393.3	9.9	Wf
	4383.7	10.0	Bh	4397.8	10.0	Kl
	4384.2	9.3	Pt	4402.8	10.2	Kl
	4385.1	9.3	Jo	4403.1	10.2	Jo
	4385.1	9.5	Mh	4406.2	10.0	Wf
162319 Y SCORPII—						
	4371.9	11.4	L			
162807 SS HERCULIS—						
	4376.9	11.2	L	4415.0	10.0	Ya
	4384.2	10.5	Pt			
162815 T OPHIUCHI—						
	4342.5	12.3	Bl	4377.9	13.0	L

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
162816 S Ophiuchi—						
	4342.5	12.2	Bl			
163137 W Herculis—						
	4379.7	10.6	Ch	4386.1	11.0	Cu
	4384.2	11.0	Pt	4398.1	11.5	B
163266 R Draconis—						
	4334.6	9.7	Ch	4387.1	7.9	Jo
	4345.7	8.7	Ch	4388.1	8.5	Su
	4371.6	8.4	Ch	4389.1	7.8	Jo
	4381.2	7.9	Br	4403.1	8.4	Jo
	4384.2	8.0	Pt	4406.9	8.7	Lp
	4385.1	8.9	Mh	4414.0	9.2	Ya
	4385.2	8.0	Jo	4415.1	9.0	Su
164319 RR Ophiuchi—						
	4349.7	12.0	Sm	4384.2	11.4	Pt
	4377.9	11.3	L			
164715 S Herculis—						
	4345.5	8.4	Ik	4360.5	9.4	Ik
	4349.5	8.6	Ik	4384.2	9.8	Pt
	4350.6	8.7	Ik	4386.1	10.0	Cu
	4351.5	8.8	Ik	4387.1	9.9	Jo
	4353.5	9.0	Ik	4389.1	10.1	Jo
	4356.6	9.2	Ik	4403.1	10.3	Jo
164844 RS Scorpii—						
	4333.7	9.1	Sm	4349.7	10.5	Ht
	4339.7	9.6	Ht	4349.7	9.4	Sm
	4341.7	9.4	Sm	4360.7	10.0	Sm
	4342.5	9.9	Bl	4361.6	9.7	Bl
165030 RR Scorpii—						
	4342.5	10.8	Bl	4361.6	10.6	Bl
165202 SS Ophiuchi—						
	4384.2	11.6	Pt	4393.0	12.2	Cu
	4387.1	11.8	Cu	4403.0	12.4	Cu
165631 RV Herculis—						
	4384.2	9.9	Pt	4403.1	9.7	Jo
	4385.1	10.0	Bi	4408.1	9.8	B
	4388.1	9.9	Jo	4413.1	9.5	Jo
	4397.1	9.7	Bi			
165636 RT Scorpii—						
	4346.4	[14.0	Bl			
170215 R Ophiuchi—						
	4334.6	8.7	Ch	4356.6	9.3	Ik
	4345.5	8.6	Ik	4357.5	9.4	Ik
	4345.7	9.0	Ch	4372.7	10.8	Ch
	4350.6	9.0	Ik	4384.2	11.0	Pt
	4351.6	9.0	Ik	4398.1	11.9	B
	4353.5	9.0	Ik			
170627 RT Herculis—						
	4381.2	14.4	Wf	4406.2	14.6	Wf
	4389.2	14.6	Wf			
170833 RW Scorpii—						
	4342.5	11.3	Bl	4361.6	11.3	Bl
171401 Z Ophiuchi—						
	4384.2	11.4	Pt	4415.5	9.5	Ya
	4392.1	10.1	Cu			
171723 RS Herculis—						
	4381.3	12.1	Wf	4391.3	12.1	Wf
	4382.1	11.8	Cu	4406.2	12.1	Wf
	4384.2	12.4	Pt			
172486 S Octantis—						
	4339.8	[12.1	Ht	4349.7	[12.8	Bl
	4346.5	[13.0	Bl			
172809 RU Ophiuchi—						
	4384.2	12.6	Pt			
173543 RU Scorpii—						
	4342.5	11.1	Bl	4361.6	10.8	Bl
174135 SV Scorpii—						
	4346.4	[13.0	Bl			
174162 W Pavonis—						
	4339.8	[12.1	Ht	4349.5	[12.3	Ht
	4346.5	[13.0	Bl			
174406 RS Ophiuchi—						
	4384.2	11.1	Pt			
174551 U Arae—						
	4341.7	9.6	Sm	4360.7	11.7	Sm
	4349.7	10.0	Sm			
175458a T Draconis—						
	4381.3	12.8	Wf	4393.3	12.8	Wf
	4389.2	12.9	Wf	4406.2	13.0	Wf
1754588 UY Draconis—						
	4381.3	11.1	Wf	4393.3	11.1	Wf
	4389.2	11.2	Wf	4406.2	11.3	Wf
175519 RY Herculis—						
	4379.7	10.8	Ch	4393.1	9.2	Cu
	4384.2	10.0	Pt	4397.1	9.0	Bi
	4387.1	9.6	Bi	4408.1	9.4	B
	4388.7	9.4	Ch	4415.0	8.9	Ya
180363 R Pavonis—						
	4339.8	9.4	Ht	4349.8	10.4	Sm
	4341.8	9.1	Sm	4360.7	11.1	Sm
	4349.7	9.8	Ht			
180531 T Herculis—						
	4353.5	8.6	Kk	4388.1	9.6	Al
	4356.5	8.6	Kk	4388.1	9.5	Ly
	4357.6	8.6	Kk	4388.7	9.6	Ch
	4379.7	9.0	Ch	4389.1	9.5	Jo
	4381.1	9.3	L	4389.2	9.8	Wf
	4381.3	9.2	Wf	4391.3	10.2	Wf
	4383.3	9.5	Wf	4391.9	9.8	Lp
	4383.6	9.7	Kk	4393.1	10.2	Cu
	4383.7	9.8	Bh	4393.3	10.0	Wf
	4384.1	8.9	Ly	4403.1	11.0	Jo
	4384.2	9.5	Pt	4406.3	11.1	Wf
	4386.1	9.3	Ly	4406.9	11.1	Lp
	4386.1	9.5	Jo	4415.1	11.6	Su
	4387.1	9.3	Cm			
180565 W Draconis—						
	4384.2	12.7	Pt	4397.1	13.8	Bi
	4387.1	13.3	Bi			
180666 X Draconis—						
	4384.2	11.6	Pt	4397.1	13.0	Bi
	4387.1	12.5	Bi			
180911 Nova Ophiuchi—						
	4384.2	[13.0	Pt			
181031 TV Herculis—						
	4381.1	[13.0	L			
181103 RY Ophiuchi—						
	4381.3	13.9	Wf	4391.3	13.5	Wf
	4383.3	13.8	Wf	4393.3	13.4	Wf
	4384.2	12.6	Pt	4397.1	12.3	Bi

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
181103 RY OPHIUCHI—Contniued.						
	4387.1	12.5	Bi	4406.3	11.8	Wf
	4389.2	13.6	Wf			
181136 W LYRAE—						
	4381.1	9.3	L	4389.2	9.6	Wf
	4381.3	9.4	Wf	4391.3	9.2	Wf
	4383.3	9.7	Wf	4392.2	8.6	Jo
	4383.6	9.7	Kk	4393.3	8.9	Wf
	4384.2	9.0	Pt	4393.1	9.0	Cu
	4386.2	9.2	Jo	4403.2	8.5	Jo
	4388.1	8.9	Al	4406.3	8.7	Wf
	4388.1	9.0	Su	4408.1	8.5	B
	4388.2	8.9	Jo	4413.1	8.3	Jo
182133 RV SAGITTARII—						
	4346.4	[13.6	Bl			
182224 SV HERCULIS—						
	4373.0	9.8	L	4408.1	10.0	B
183149 SV DRACONIS—						
	4365.2	[12.1	Cu	4403.1	[13.6	Cu
183308 X OPHIUCHI—						
	4373.0	8.6	L	4388.1	8.3	Ly
	4374.6	8.5	Mm	4400.0	8.0	Cu
	4384.1	8.4	Ly	4402.1	8.4	Ly
	4384.2	8.4	Pt	4403.1	8.2	Jo
	4386.1	8.4	Jo	4413.1	8.0	Jo
	4388.1	8.4	Jo	4415.1	8.0	Ya
184134 RY LYRAE—						
	4405.1	[13.3	Cu			
184205 R SCUTI—						
	4313.9	6.0	An	4385.1	5.9	Ly
	4314.9	6.0	An	4385.2	5.4	Pt
	4318.9	5.9	An	4385.5	5.5	Kd
	4320.9	5.9	An	4385.7	5.1	Bh
	4324.9	5.9	An	4386.1	5.5	Cu
	4326.9	5.8	An	4386.2	5.4	Pt
	4343.9	5.3	An	4387.1	4.8	Jo
	4345.7	5.3	Ch	4387.1	5.6	BS
	4345.9	5.3	An	4387.1	5.6	Cu
	4346.9	5.2	An	4387.1	5.3	Du
	4348.6	4.9	H	4387.2	6.0	Gb
	4350.6	4.9	H	4387.2	5.2	Pt
	4350.9	5.2	An	4387.7	5.5	Bh
	4351.5	4.9	H	4388.2	5.2	Pt
	4351.9	5.3	An	4389.0	5.3	Du
	4353.5	4.9	H	4389.1	5.5	Ks
	4353.8	5.2	An	4289.1	4.8	Jo
	4354.9	5.3	An	4389.9	5.6	An
	4356.5	5.3	H	4390.0	5.3	Du
	4356.9	5.2	An	4390.1	5.4	Kd
	4357.6	4.9	H	4390.2	5.2	Pt
	4358.9	5.3	An	4391.1	5.4	BS
	4360.5	4.9	Kd	4391.2	5.3	Pt
	4360.9	5.4	An	4391.5	5.5	Kd
	4361.5	5.1	Kd	4392.1	5.6	Cu
	4362.5	5.0	Kd	4393.1	5.7	Cu
	4364.9	5.3	An	4394.2	5.3	Pt
	4369.5	5.4	An	4394.8	5.6	An
	4370.5	5.4	Kd	4395.2	5.2	Pt
	4370.8	5.5	An	4396.2	5.2	Pt
	4371.1	5.4	Cu	4396.7	5.0	Bh
	4371.5	5.3	Kd	4397.1	5.4	Ks
184205 R SCUTI—Continued.						
	4372.8	5.6	An	4397.1	5.1	Cu
	4373.0	5.3	L	4397.1	5.3	Du
	4373.9	5.4	An	4397.2	5.3	Pt
	4374.5	5.3	Kd	4398.1	5.0	Du
	4374.6	5.3	Mm	4398.1	5.7	Ly
	4375.6	5.5	Kd	4398.2	5.3	Pt
	4376.9	5.7	An	4398.7	5.8	Bh
	4377.9	5.8	An	4400.0	5.1	Cu
	4379.7	5.7	Ch	4400.1	5.2	Du
	4380.1	5.7	BS	4401.2	5.2	Pt
	4380.5	5.6	Kd	4401.6	5.4	Mh
	4381.2	5.4	Pt	4402.1	5.7	Ly
	4381.4	5.5	Kd	4403.0	5.5	Cu
	4381.9	5.8	An	4403.1	5.3	Du
	4382.1	5.8	Ly	4404.1	5.2	Du
	4383.2	5.7	BS	4404.2	5.5	Pt
	4383.2	5.4	Pt	4407.2	5.2	Pt
	4383.7	5.0	Bh	4407.2	5.8	Gb
	4383.9	5.7	An	4408.8	5.7	Ro
	4384.2	5.2	Pt	4409.2	5.2	Pt
	4384.5	5.4	Kd	4411.2	5.2	Pt
	4385.1	5.0	Jo	4412.2	5.2	Pt
	4385.1	5.4	Mm	4413.2	5.6	Pt
184243 RW LYRAE—						
	4384.2	12.6	Pt	4400.1	12.4	Cu
	4393.1	12.5	Cu	4408.2	12.5	B
184300 NOVA AQUILAE—						
	4353.6	10.4	Ch	4398.2	10.5	Pt
	4381.2	10.6	Pt	4408.8	10.6	Ro
	4388.7	10.4	Ch	4411.2	10.6	Pt
	4390.2	10.5	Pt			
185032 RX LYRAE—						
	4388.7	[11.3	Ch	4403.2	[13.0	Cu
185437a S CORONAE AUSTRALIS—						
	4342.5	11.3	Bl	4361.6	12.1	Bl
	4346.5	11.5	Bl	4362.6	12.5	Bl
185512a ST SAGITTARII—						
	4353.6	[11.2	Ch	4379.7	[11.2	Ch
	4377.9	[14.0	L	4403.1	[12.8	Cu
185537a R CORONAE AUSTRALIS—						
	4342.5	11.1	Bl	4361.6	12.2	Bl
	4346.5	11.3	Bl			
185537b T CORONAE AUSTRALIS—						
	4342.5	[12.5	Bl	4346.5	[13.0	Bl
185634 Z LYRAE—						
	4389.1	13.3	Cu			
185737 RT LYRAE—						
	4349.6	[12.0	Ch			
190108 R AQUILAE—						
	4384.2	10.5	Pt	4391.9	10.1	Lp
	4388.7	10.6	Ch	4406.9	9.8	Lp
190529a V LYRAE—						
	4365.2	10.4	Cu	4389.1	11.3	Cu
	4384.2	10.9	Pt			
190818 RX SAGITTARII—						
	4334.6	[10.8	Ch	4382.7	[10.8	Ch
	4353.7	[11.8	Ch			

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
190819a RW SAGITTARII—						
	4334.6	9.5	Ch	4371.6	9.5	Ch
	4345.7	9.3	Ch	4382.7	9.5	Ch
	4353.6	9.6	Ch	4384.2	9.0	Pt
190925 S LYRAE—						
	4387.2	[13.1	Br	4403.1	[13.1	Cu
190926 X LYRAE—						
	4384.2	9.1	Pt			
190933a RS LYRAE—						
	4387.2	[13.4	Br			
190941 RY LYRAE—						
	4387.2	14.0	Br	4403.1	13.1	Cu
190967 U DRACONIS—						
	4334.6	10.0	Ch	4381.2	10.1	Br
	4345.7	9.8	Ch	4384.2	10.6	Pt
	4371.7	10.2	Ch	4407.3	11.7	Br
191007 W AQUILAE—						
	4349.6	8.6	Ch	4379.7	8.2	Ch
	4356.6	8.2	Ch	4384.2	7.5	Pt
191017 T SAGITTARII—						
	4334.6	8.8	Ch	4371.6	7.8	Ch
	4345.7	8.3	Ch	4382.7	8.0	Ch
	4383.6	8.2	Ch	4384.2	8.1	Pt
191019 R SAGITTARII—						
	4334.6	7.5	Ch	4360.5	8.8	Ik
	4353.6	8.5	Ch	4371.6	9.6	Ch
	4351.6	8.6	Ik	4382.7	10.1	Ch
	4357.6	8.6	Kk	4384.2	10.0	Pt
191033 RY SAGITTARII—						
	4341.7	7.3	Sm	4384.5	7.3	Kd
	4342.5	7.0	Bl	4386.2	6.6	Pt
	4345.7	7.1	Ch	4387.2	6.5	Pt
	4349.8	7.1	Sm	4387.2	7.0	Bh
	4360.7	7.0	Sm	4388.2	6.7	Pt
	4361.6	6.4	Bl	4390.2	6.3	Pt
	4362.4	6.5	Bl	4391.2	6.2	Pt
	4370.5	7.3	Kd	4396.2	6.2	Pt
	4371.6	7.1	Ch	4398.2	6.5	Pt
	4371.9	7.2	L	4398.2	7.0	Bh
	4374.6	7.3	Kd	4401.2	6.6	Pt
	4381.2	6.8	Pt	4407.2	6.7	Pt
	4383.2	7.3	Bh	4411.2	6.7	Pt
	4384.2	6.7	Pt	4412.2	6.8	Pt
191124 TY SAGITTARII—						
	4346.5	[13.0	Bl			
191319 S SAGITTARII—						
	4346.5	10.7	Bl	4403.1	13.6	Cu
	4362.4	[11.8	Bl			
191331 SW SAGITTARII—						
	4346.5	[12.9	Bl			
191350 TZ CYGNI—						
	4384.2	10.7	Pt	4400.1	10.3	Cu
192928 TY CYGNI—						
	4349.6	11.2	Ch	4384.2	9.2	Pt
	4371.6	10.3	Ch	4400.2	9.8	Cu
193311 RT AQUILAE—						
	4349.6	11.5	Ch	4392.2	13.6	Cu
	4384.2	13.2	Pt	4403.1	14.1	Ch
	4386.3	13.2	Cu			
193449 R CYGNI—						
	4345.7	10.5	Ch	4389.2	10.3	Wf
	4365.2	11.4	Cu	4392.2	9.5	Jo
	4370.6	10.9	Ch	4393.3	9.9	Wf
	4381.3	10.4	Wf	4398.2	9.6	Pt
	4382.2	9.9	Bi	4400.2	9.8	Cu
	4384.1	9.6	Ly	4402.1	9.6	Ly
	4385.2	10.9	Jo	4403.2	9.4	Jo
	4385.6	10.7	Ch	4404.1	9.6	Al
	4386.2	10.8	Jo	4404.2	9.5	Gb
	4387.1	10.5	Al	4406.3	9.4	Wf
	4388.2	10.8	Jo	4413.2	8.2	Jo
	4389.2	10.6	Jo			
193509 RV AQUILAE—						
	4387.2	13.5	Br	4398.2	12.8	Pt
193972 T PAVONIS—						
	4339.8	10.5	Ht	4349.8	11.5	Ht
	4341.7	11.5	Sm	4349.8	11.9	Sm
	4346.5	11.0	Bl	4362.4	12.1	Bl
194048 RT CYGNI—						
	4365.3	11.2	Cu	4398.2	8.4	Pt
	4370.6	10.9	Ch	4400.0	8.2	Cu
	4385.2	8.8	Jo	4404.0	8.0	Du
	4385.6	9.4	Ch	4407.2	8.0	Gb
	4386.3	9.2	Cu	4413.2	7.5	Jo
194348 TU CYGNI—						
	4357.5	10.2	Kk	4386.3	10.4	Cu
	4365.2	9.6	Cu	4398.2	11.0	Pt
	4370.6	9.7	Ch	4400.0	10.0	Cu
	4382.2	9.9	Bi	4404.0	11.4	Du
	4385.6	9.8	Ch			
194604 X AQUILAE—						
	4381.3	15.0	Wf	4406.3	14.4	Wf
	4389.2	14.8	Wf			
194632 χ CYGNI—						
	4381.3	13.0	Wf	4393.3	12.8	Wf
	4386.3	12.9	Cu	4398.2	13.5	Pt
	4387.2	13.0	Br	4403.1	12.1	Cu
	4389.3	12.9	Wf	4403.1	12.1	Du
	4391.9	[13.0	Lp	4406.3	12.5	Wf
194929 RR SAGITTARII—						
	4346.5	11.9	Bl	4362.4	11.6	Bl
195142 RU SAGITTARII—						
	4339.8	10.1	Ht	4349.8	8.2	Sm
	4341.7	9.4	Sm	4360.7	7.7	Sm
	4346.5	9.1	Bl	4362.4	7.1	Bl
	4349.7	8.8	Ht			
195202 RR AQUILAE—						
	4398.2	10.0	Pt	4400.2	9.6	Cu
195553 NOVA CYGNI—						
	4381.2	12.6	Pt	4400.2	12.8	Cu
	4385.2	12.6	Pt	4411.2	12.6	Pt
	4398.2	12.6	Pt			
195849 Z CYGNI—						
	4353.6	11.1	Ch	4403.2	12.7	Cu
	4381.3	13.8	Wf	4406.3	14.0	Wf
	4389.3	14.0	Wf	4411.2	12.0	Pt
195855 S TELESCOPII—						
	4346.5	13.0	Bl			
200212 SY AQUILAE—						
	4379.2	13.8	Br	4411.2	13.0	Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
200357 S CYGNI—						
	4365.3	12.4	Cu	4392.3	10.4	Wf
	4376.6	11.7	Ch	4393.2	10.5	Br
	4381.3	11.9	Wf	4400.2	10.0	Cu
	4382.2	11.7	Bi	4406.3	9.8	Wf
	4389.3	11.1	Wf	4411.2	10.0	Pt
200514 R CAPRICORNI—						
	4404.1	12.6	B			
200715a S AQUILAE—						
	4381.3	9.7	Wf	4393.3	10.8	Wf
	4383.3	9.6	Wf	4406.3	11.0	Wf
	4389.3	10.8	Wf	4406.9	10.5	Lp
	4391.3	10.8	Wf	4411.2	11.0	Pt
	4391.9	10.1	Lp			
200715*8* RW AQUILAE—						
	4411.2	9.2	Pt			
200747 R TELESCOPII—						
	4346.5	13.4	Bl			
200812 RU AQUILAE—						
	4406.2	13.7	Br			
200822 W CAPRICORNI—						
	4346.5	12.6	Bl			
200906 Z AQUILAE—						
	4402.1	13.7	B	4411.2	12.8	Pt
	4407.2	[13.6	Br			
200938 RS CYGNI—						
	4300.6	8.1	Kk	4387.2	7.2	Jo
	4334.6	7.2	Ch	4388.1	7.4	Al
	4339.7	7.3	Ch	4388.1	8.4	Ly
	4345.7	7.4	Ch	4388.2	7.6	Jo
	4354.7	7.4	Ch	4392.2	8.0	Cu
	4365.2	7.1	Cu	4400.1	8.3	Cu
	4370.6	7.4	Ch	4403.2	7.8	Jo
	4376.1	7.1	L	4407.2	7.6	Gb
	4380.6	7.4	Ch	4411.2	7.5	Pt
	4384.1	8.6	Ly	4413.2	7.8	Jo
	4385.2	7.4	Jo			
201008 R DELPHINI—						
	4376.1	8.7	L	4406.2	9.2	Br
	4400.2	9.2	Cu	4411.2	9.7	Pt
201121 RT CAPRICORNI—						
	4411.2	6.8	Pt			
201130 SX CYGNI—						
	4400.2	9.8	Cu	4411.2	11.0	Pt
201139 RT SAGITTARII—						
	4346.5	8.5	Bl	4362.4	8.0	Bl
201437b WX CYGNI—						
	4354.7	11.4	Ch	4388.1	10.5	Al
	4365.2	10.7	Cu	4392.2	10.9	Cu
	4370.6	11.0	Ch	4407.2	8.6	Gb
	4382.2	9.6	Bi	4411.2	11.6	Pt
	4386.2	10.8	Cu			
201647 V CYGNI—						
	4365.3	9.0	Cu	4400.2	8.3	Cu
	4376.6	9.6	Ch	4403.2	8.0	Jo
	4382.2	8.4	Bi	4408.8	7.8	Ro
	4385.3	8.5	Jo	4411.2	7.8	Pt
	4388.3	8.4	Jo	4413.2	7.8	Jo
202240 U MICROSCOPII—						
	4346.5	[13.6	Bl			
202817 Z DELPHINI—						
	4411.2	9.8	Pt			
202946 SZ CYGNI—						
	4381.2	9.4	Pt	4395.2	9.5	Pt
	4383.2	9.9	Pt	4396.2	9.6	Pt
	4384.2	9.8	Pt	4397.2	9.8	Pt
	4385.2	9.6	Pt	4398.2	9.8	Pt
	4386.2	9.6	Pt	4401.2	9.5	Pt
	4387.2	9.4	Pt	4407.2	9.0	Pt
	4388.2	9.1	Pt	4409.2	9.5	Pt
	4390.2	9.0	Pt	4411.2	9.4	Pt
	4391.2	9.3	Pt	4412.2	9.8	Pt
	4392.2	8.9	Pt	4413.2	9.7	Pt
	4394.2	9.3	Pt			
202954 ST CYGNI—						
	4365.3	12.3	Cu	4393.2	11.3	Br
	4382.2	11.4	Bi	4411.2	10.9	Pt
203226 V VULPECULAE—						
	4411.2	8.6	Pt			
203429 R MICROSCOPII—						
	4346.5	11.0	Bl	4362.4	[12.2	Bl
203816 S DELPHINI—						
	4365.3	11.8	Cu	4411.2	10.5	Pt
203847 V CYGNI—						
	4347.7	10.6	Ch	4389.3	11.1	Wf
	4376.6	11.2	Ch	4393.3	11.2	Wf
	4381.3	11.3	Wf	4406.3	11.3	Wf
	4382.2	10.2	Bi	4411.2	11.8	Pt
203905 Y AQUARII—						
	4385.7	9.4	Ch	4400.1	9.7	Cu
	4393.1	9.8	Cu	4402.1	9.1	B
204016 T DELPHINI—						
	4380.6	9.6	Ch	4406.3	10.9	Wf
	4381.3	9.7	Wf	4411.2	11.2	Pt
	4389.3	10.2	Wf			
204102 V AQUARII—						
	4393.2	8.9	Cu	4411.2	8.4	Pt
204104 W AQUARII—						
	4375.1	12.0	L	4402.1	12.8	B
	4393.1	12.1	Cu	4408.1	13.0	B
204215 U CAPRICORNI—						
	4346.5	11.7	Bl	4362.6	12.2	Bl
204318 V DELPHINI—						
	4379.2	[13.7	Br	4407.2	[14.0	Br
	4392.2	[14.0	Br			
204405 T AQUARII—						
	4345.7	9.7	Ch	4388.2	7.6	Jo
	4379.7	7.6	Ch	4393.1	7.5	Cu
	4382.1	7.4	Ly	4394.1	7.5	Ly
	4384.1	7.5	Ly	4398.1	7.7	Ly
	4385.6	7.4	Ch	4402.1	7.8	Ly
	4386.2	7.6	Jo	4411.2	7.6	Pt
	4388.1	7.2	Ly			
204846 RZ CYGNI—						
	4365.3	11.7	Cu	4393.2	12.3	Cu
	4381.3	12.0	Wf	4406.3	12.9	Wf
	4382.2	11.9	Bi	4411.2	12.2	Pt
	4389.3	12.2	Wf			
204954 S INDI—						
	4346.5	13.2	Bl			

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
205017a X DELPHINI—						
	4379.3	8.5	Br	4393.2	12.5	Cu
	4393.2	8.5	Cu	4411.2	8.8	Pt
205923a R VULPECULAE—						
	4365.3	11.8	Cu	4392.2	9.0	Wf
	4379.3	10.0	Br	4392.2	9.1	Jo
	4381.3	10.0	Wf	4393.2	9.4	Cu
	4382.2	9.8	Wf	4393.3	8.0	Wf
	4383.3	9.8	Wf	4394.3	8.8	Wf
	4384.3	9.6	Wf	4395.2	8.8	Wf
	4386.2	9.2	Jo	4396.2	8.6	Wf
	4388.2	9.1	Jo	4397.3	8.3	Wf
	4389.3	9.1	Wf	4406.2	8.1	Wf
	4390.3	9.0	Wf	4407.3	8.0	Wf
	4391.3	9.1	Wf	4411.2	8.1	Pt
210124 V CAPRICORNI—						
	4346.5	11.4	Bl	4362.6	9.8	Bl
210129 TW CYGNI—						
	4379.3	12.9	Br	4407.2	12.4	Br
	4393.2	12.6	Cu			
210221 X CAPRICORNI—						
	4346.5	11.9	Bl	4362.6	11.3	Bl
210382 X CEPHEI—						
	4392.2	[13.8	Br	4407.3	[13.7	Br
	4398.2	[13.7	Br			
210504 RS AQUARII—						
	4374.1	10.5	L	4411.2	13.4	Pt
	4408.2	12.6	B			
210516 Z CAPRICORNI—						
	4408.2	9.7	B	4411.2	10.2	Pt
210812 R EQUULEI—						
	4379.3	13.5	Br	4406.3	11.2	Wf
	4381.3	13.4	Wf	4407.2	11.0	Br
	4389.3	12.7	Wf	4411.2	10.3	Pt
210868 T CEPHEI—						
	4335.6	6.3	Ik	4372.7	6.2	Ch
	4339.7	5.7	Ch	4375.1	6.0	L
	4345.5	6.1	Ik	4383.5	6.5	Kk
	4345.7	5.6	Ch	4385.1	6.6	Jo
	4349.5	6.1	Ik	4385.7	6.6	Ch
	4350.6	5.9	Kk	4387.1	6.7	Du
	4351.5	5.8	Ik	4388.1	6.5	Jo
	4353.5	5.8	Ik	4389.0	6.6	Du
	4353.6	5.9	Kk	4389.1	6.5	Cg
	4353.6	5.6	Ch	4392.1	6.8	Cm
	4356.6	5.8	Ik	4397.1	6.9	Du
	4356.6	6.0	Kk	4400.1	6.9	Du
	4357.5	5.8	Ik	4403.0	7.3	Du
	4357.6	6.0	Kk	4403.1	6.7	Jo
	4360.5	5.8	Ik	4409.2	6.7	Pt
	4364.6	6.0	Ch	4413.2	6.8	Jo
210903 RR AQUARII—						
	4379.3	10.0	Br	4409.2	9.4	Pt
211614 X PEGASI—						
	4381.3	9.7	Wf	4393.3	10.0	Wf
	4383.3	9.8	Wf	4406.3	10.6	Wf
	4389.3	9.8	Wf	4407.2	11.0	Br
	4391.3	9.9	Wf	4409.2	11.2	Pt
211615 T CAPRICORNI—						
	4346.5	[12.7	Bl	4408.2	9.3	B
	4385.6	11.4	Ch			
212030 S MICROSCOPII—						
	4346.5	12.5	Bl	4362.4	12.0	Bl
	4349.8	[12.4	Sm	4383.7	[10.3	Bh
	4360.8	[11.8	Sm			
212814 Y CAPRICORNI—						
	4346.5	[12.6	Bl	4408.2	[13.5	B
	4385.6	[10.6	Ch			
213244 W CYGNI—						
	4313.9	6.5	An	4375.6	6.5	Kd
	4326.9	6.6	An	4381.4	6.4	Kd
	4345.9	6.3	An	4381.6	6.6	Kd
	4353.8	6.5	An	4381.9	6.9	An
	4361.9	6.5	An	4382.5	6.5	Kd
	4367.5	6.3	Kd	4382.9	6.5	An
	4370.5	6.3	Kd	4384.5	6.5	Kd
	4370.8	6.6	An	4386.6	6.6	Kd
	4371.5	6.4	Kd	4390.6	6.8	Kd
	4372.5	6.4	Kd	4391.5	6.6	Kd
	4374.5	6.4	Kd			
213678 S CEPHEI—						
	4381.2	9.3	Cu	4392.8	9.0	Cu
	4384.2	7.6	Bi	4409.2	8.5	Pt
	4387.1	8.8	Cu			
213843 SS CYGNI—						
	4339.7	10.0	Ch	4389.3	9.3	Wf
	4345.7	8.3	Ch	4389.9	9.4	Kl
	4347.7	8.6	Ch	4390.0	9.2	Du
	4348.7	9.4	Ch	4390.1	8.5	Ly
	4349.6	10.1	Ch	4390.2	9.5	Pt
	4353.6	11.3	Ch	4390.3	9.0	Wf
	4353.9	11.0	Kl	4390.3	9.1	Cu
	4355.9	10.5	L	4391.0	9.2	Cu
	4364.9	11.6	Ch	4391.1	8.8	Du
	4365.2	11.5	Cu	4391.1	8.3	Ly
	4368.9	11.3	Kl	4391.2	9.0	Pt
	4370.6	11.4	Ch	4391.3	8.8	Cu
	4371.6	11.4	Ch	4391.8	9.0	Kl
	4371.9	10.9	L	4392.1	8.4	Cu
	4372.7	11.4	Ch	4392.2	8.7	Br
	4373.0	11.2	L	4392.2	8.9	Pt
	4373.7	11.5	Ch	4392.3	8.8	Wf
	4373.9	11.1	L	4393.1	8.5	Cu
	4374.9	10.9	Kl	4393.2	8.9	Br
	4375.1	12.0	L	4393.3	8.8	Wf
	4375.9	10.7	Kl	4394.1	8.3	Ly
	4376.1	12.0	L	4394.2	8.6	Pt
	4376.6	11.2	Ch	4394.2	8.7	Br
	4376.9	10.9	L	4394.3	8.7	Wf
	4377.7	11.2	Ch	4395.0	8.4	Cu
	4377.8	10.6	L	4395.2	8.6	Pt
	4377.9	10.7	Kl	4395.2	8.6	Br
	4378.9	11.6	Ch	4395.2	8.8	Wf
	4379.7	11.9	Ch	4396.0	8.5	Cu
	4379.9	10.7	Kl	4396.2	8.6	Wf
	4380.6	11.5	Ch	4396.2	8.6	Pt
	4381.1	11.6	L	4396.2	8.7	Br
	4381.2	11.6	Br	4397.1	8.8	Ks
	4381.2	11.7	Pt	4397.1	8.3	Du
	4381.2	11.3	Wf	4397.1	8.6	Cu
	4381.7	11.5	Ch	4397.2	8.9	Pt
	4382.2	11.7	Bi	4397.2	8.6	Br

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
213843 SS CYGNI—Continued.						
	4382.2	11.3	Wf	4397.3	8.6	Wf
	4382.7	11.5	Ch	4397.8	8.5	Kl
	4382.9	10.7	Kl	4398.0	8.8	B
	4383.1	10.6	Ks	4398.0	8.3	Du
	4383.2	11.3	Pt	4398.1	8.5	Ly
	4383.3	11.3	L	4398.2	9.0	Pt
	4383.3	11.7	Br	4398.2	8.7	Br
	4383.3	11.3	Wf	4399.8	8.4	Ro
	4383.7	11.5	Ch	4400.0	8.9	Cu
	4384.1	11.3	Ly	4400.1	8.6	Du
	4384.2	10.9	Bi	4401.2	9.0	Br
	4384.2	11.5	Pt	4401.2	9.2	Pt
	4384.3	11.3	Wf	4402.0	9.5	B
	4385.1	11.1	Du	4402.1	8.9	Ly
	4385.1	11.0	Ly	4402.8	9.6	Kl
	4385.2	11.5	Pt	4403.0	9.2	Du
	4385.6	11.0	Ch	4403.0	9.3	Cu
	4386.1	10.1	Ly	4403.1	9.6	Ly
	4386.2	10.4	Pt	4403.2	9.5	Br
	4386.2	11.0	Cu	4404.0	9.8	Du
	4387.1	10.2	Du	4404.0	10.1	B
	4387.1	9.4	Ly	4404.8	9.7	Ro
	4387.1	10.0	Cu	4406.2	10.7	Br
	4387.1	10.4	Al	4406.3	10.0	Wf
	4387.2	9.5	Pt	4407.2	11.7	Pt
	4387.2	10.1	Br	4407.2	11.0	Br
	4387.6	10.0	Ch	4407.3	11.5	Wf
	4388.1	9.7	Du	4408.1	11.7	B
	4388.1	9.6	Ly	4408.8	11.8	Ro
	4388.2	9.8	Pt	4409.2	11.8	Pt
	4388.7	9.4	Ch	4411.2	11.8	Pt
	4389.0	9.7	Du	4412.2	11.8	Pt
	4389.1	8.8	Ly	4413.2	11.7	Pt
213937 RV CYGNI—						
	4409.2	6.6	Pt			
214024 RR PEGASI—						
	4379.3	13.3	Br	4404.1	11.0	B
	4381.3	13.4	Wf	4406.3	10.8	Wf
	4388.1	13.1	Cu	4407.2	10.8	Br
	4389.3	13.0	Wf	4409.2	9.8	Pt
214247 R GRUIS—						
	4339.8	9.3	Ht	4349.9	8.6	Ht
	4341.8	8.8	Sm	4360.8	8.3	Sm
	4346.6	8.5	Bl	4362.4	8.1	Bl
	4349.8	8.6	Sm			
215605 V PEGASI—						
	4384.2	13.1	Bi	4404.1	13.9	B
215717 U AQUARII—						
	4408.2	12.3	B	4409.2	12.1	Pt
215934 RT PEGASI—						
	4379.3	[13.0	Br	4393.3	[13.0	Br
	4381.7	[12.3	Ch	4407.2	[13.0	Br
	4384.2	[13.5	Bi			
220133b RZ PEGASI—						
	4409.2	11.5	Pt			
220412 T PEGASI—						
	4381.7	[11.6	Ch	4407.2	13.5	Br
220613 Y PEGASI—						
	4379.3	12.8	Br	4407.2	11.4	Br
	4384.2	12.4	Bi	4409.2	11.8	Pt
220714 RS PEGASI—						
	4379.3	13.6	Br	4407.2	13.3	Br
	4384.2	12.9	Bi			
221938 T GRUIS—						
	4349.8	9.2	Sm	4360.8	9.6	Sm
221948 S GRUIS—						
	4349.9	[12.8	Ht	4349.8	[12.8	Sm
222129 RV PEGASI—						
	4379.3	[12.5	Br	4389.2	[12.5	Cu
222439 S LACERTAE—						
	4380.6	8.7	Ch	4393.2	8.3	Cu
	4384.2	8.5	Bi	4409.2	8.4	Pt
	4389.9	8.5	An			
222867 R INDI—						
	4346.5	12.5	Bl			
223462 T TUCANAE—						
	4341.8	11.3	Sm	4349.9	10.7	Ht
	4349.8	10.9	Sm	4360.7	10.6	Sm
223841 R LACERTAE—						
	4380.6	11.8	Ch	4409.2	10.2	Pt
	4384.2	12.2	Bi			
225914 RW PEGASI—						
	4365.3	12.1	Cu	4409.2	10.7	Pt
	4379.3	13.3	Br			
230110 R PEGASI—						
	4381.3	10.3	Wf	4394.3	10.4	Wf
	4388.2	10.6	Cu	4402.8	10.3	Kl
	4389.3	10.6	Wf	4406.3	10.8	Wf
	4389.9	10.0	Kl	4411.2	11.8	Pt
230759 V CASSIOPEIAE—						
	4356.6	12.0	Kk	4408.8	9.6	Ro
	4393.3	10.7	Br	4411.2	9.4	Pt
	4403.0	10.0	Du			
231425 W PEGASI—						
	4380.7	10.6	Ch	4389.9	10.0	Kl
	4381.8	9.9	An	4389.9	9.8	An
	4384.2	9.3	Bi	4402.8	9.3	Kl
	4397.8	9.5	Kl			
231508 S PEGASI—						
	4381.7	[10.6	Ch	4411.2	11.0	Pt
	4407.3	11.3	Br			
232746 V PHOENICIS—						
	4349.9	9.7	Ht	4349.9	10.0	Sm
232848 Z ANDROMEDAE—						
	4365.2	9.6	Cu	4386.2	9.9	Cu
	4380.7	9.4	Ch	4400.1	9.6	Cu
233335 ST ANDROMEDAE—						
	4345.7	10.4	Ch	4411.2	8.8	Pt
	4373.7	9.8	Ch			
233815 R AQUARII—						
	4352.0	9.5	An	4382.1	9.9	An
	4356.7	9.6	Kk	4392.0	9.8	An
	4362.1	9.5	An	4393.3	9.9	Cu
	4378.9	9.6	Ch	4411.2	10.0	Pt
233956 Z CASSIOPEIAE—						
	4379.3	14.5	Br	4384.2	14.0	Bi
	4381.3	14.1	Wf	4389.3	14.2	Wf
	4382.4	14.1	Wf	4406.3	14.0	Wf
	4383.3	14.2	Wf			

VARIABLE STAR OBSERVATIONS RECEIVED DURING SEPTEMBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
235053 RR CASSIOPEIAE—						
	4365.4	11.6	Cu	4393.3	12.3	Cu
	4393.3	13.4	Br			
235209 V CETI—						
	4351.7	[12.8	Bl			
235265 R TUCANAE—						
	4349.8	11.8	Sm			
235350 R CASSIOPEIAE—						
	4356.6	8.7	Kk	4393.3	10.3	Cu
235350 R CASSIOPEIAE—Continued.						
	4384.3	9.1	Bi	4404.1	10.2	Du
	4393.3	9.6	Br			
235525 Z PEGASI—						
	4407.3	9.4	Br	4411.2	8.8	Pt
235855 Y CASSIOPEIAE—						
	4404.1	11.0	Du	4407.3	11.0	Br
235939 SV ANDROMEDAE—						
	4384.3	13.8	Bi	4407.3	[12.9	Br
	4393.3	[12.7	Cu	4411.2	13.5	Pt

Total observations, 1984; stars observed, 362; total observers, 34.

In view of the decision of the majority of astronomers to adhere to the long-established custom of referring all variable star observations, when converted into Julian Day and decimal, to Greenwich Mean Noon, the Association must of necessity revert to this former method. In other words, continuity of record seems more desirable than uniformity of time, especially where variable star records are concerned. This matter will be fully discussed at the coming meeting of the Association, and the proper announcement made in the next number of POPULAR ASTRONOMY.

The following observers have contributed to this report of observations received during the month of September, 1925: Allen, "Al"; Ancarani, "An"; Baldwin, "Bl"; Ball and Southworth, "BS"; Berman, "Bi"; Bouton, "B"; Brocchi, "Br"; Bunch, "Bh"; Chandra, "Ch"; Chisholm, "Cm"; Miss Clough, "Cg"; Cunningham, "Cu"; Dunham, "Du"; Gaebler, "Gb"; Houghton, "Ht"; Ikeda, "Ik"; Jones, "Jo"; Kanda, "Kd"; Kasai, "Kk"; Kleis, "Ks"; Kohl, "Kl"; Lacchini, "L"; Lepper, "Lp"; Mrs. Lytle, "Ly"; Marshall, "Mh"; Millman, "Mm"; Murdock, "Mb"; Peltier, "Pt"; Rhorer, "Ro"; Smith, "Sm"; Suter, "Su"; Waterfield, "Wf"; and Yalden, "Ya".

LEON CAMPBELL, Recording Secretary.

October 10, 1925.

COMET NOTES.

Borrelly's Periodic Comet (f1925). — The following ephemeris of Borrelly's periodic comet is taken from the Copenhagen Circular No. 82. It was computed by A. Schaumasse, and was published in the circular of Observations at Marseilles No. 988.

EPHEMERIS OF BORRELLY'S PERIODIC COMET.

0^h U. T.		α 1925.0	δ 1925.0	log r	log Δ
		h m s	° ′		
Nov.	4	9 12 45	+25 31.5	0.1532	0.0255
	8	9 25 15	+26 55.1		
	12	9 37 37	+28 20.2	0.1601	0.0110
	16	9 49 50	+29 46.9		
	20	10 01 51	+31 15.1	0.1683	0.0015
	24	10 13 37	+32 44.3		
	28	10 25 04	+34 15.8	0.1777	9.9945
Dec.	2	10 36 10	+35 48.0		
	6	10 46 52	+37 21.3	0.1881	9.9902
	10	10 57 06	+38 55.7		
	14	11 06 47	+40 31.2	0.1992	9.9887

The comet was picked up at its present return on Aug. 14 by A. Schaumasse. Professor Van Biesbroeck says in a private letter that this is by far the easiest to observe of the comets now visible and that it is visible in a 4-inch telescope. It will be passing through Leo Minor during November.

Comet *a* 1925 (Schajn). — Professor Van Biesbroeck writes that he measured the position of this comet on the morning of October 16. He found it near the ephemeris position and that it had very much the same appearance as when he saw it last on June 9. This comet was discovered by Schajn at Simeis, Russia, on March 23, and has always been very faint since that time.

Comet *c* 1925 (Orkisz).—This comet may possibly still be observed with large telescopes during this month. It is in the rear foot of the Great Bear. The following ephemeris, calculated by J. Witkowski, is given in *Acta Astronomica*, 1925, Sept. 24, Cracow, Poland.

EPHEMERIS OF COMET *c* 1925 (ORKISZ).

0^h U. T. 1925	True α h m s	True δ ° ′	r	Δ	Br.
Nov. 3	11 56 09	+35 00.2	3.209	3.555	0.06
11	11 57 44	+35 01.4	3.297	3.534	
19	11 58 41	+35 14.1	3.384	3.504	0.05
27	11 58 32	+35 38.0	3.470	3.468	
Dec. 5	11 56 55	+36 12.6	3.556	3.428	
13	11 53 49	+36 57.1	3.641	3.386	
21	11 49 04	+37 50.1	3.726	3.348	0.04
29	11 42 31	+38 49.2	3.810	3.315	
Jan. 6	11 34 06	+39 51.4	3.894	3.291	

The brightness of the comet on June 4, 1925, is taken as the unit of brightness. During November the comet will be near the southeast corner of the constellation Canes Venatici.

Wolf's Periodic Comet *c* 1925. —The following ephemeris of Wolf's periodic comet is given in the Copenhagen Circular No. 81. It was calculated by Professor M. Kamienski and is for 12^h Universal Time.

EPHEMERIS OF WOLF'S PERIODIC COMET.

1925	True α h m s	True δ ° ′	log r	log Δ
Nov. 1	22 47 05	+7 00.8	0.3866	0.2339
5	22 49 28	+6 07.0	0.3864	0.2434
9	22 52 13	+5 17.3	0.3864	0.2534
13	22 55 19	+4 31.9	0.3865	0.2637
17	22 58 44	+3 50.9	0.3866	0.2742
21	23 02 26	+3 14.1	0.3867	0.2849
25	23 06 27	+2 41.6	0.3870	0.2956
29	23 10 43	+2 13.3	0.3873	0.3064
Dec. 3	23 15 13	+1 49.0	0.3876	0.3172
7	23 19 58	+1 28.5	0.3880	0.3279
11	23 24 56	+1 11.8	0.3885	0.3385
15	23 30 04	+0 58.4	0.3890	0.3491
19	23 35 24	+0 48.4	0.3895	0.3594
23	23 40 54	+0 41.6	0.3901	0.3696
27	23 46 32	+0 37.7	0.3908	0.3796
31	23 52 19	+0 36.4	0.3915	0.3894

Brooks' Comet 1889 V (*g* 1925).—It appears according to the *British Astronomical Association Circular* No. 12 that the detection of Brooks' periodic comet was announced incorrectly by Tscherny. It was independently found on Sept. 22 (Mag. 12.5) by Albitzky, who identified it, together with Schain's object of Sept. 9 (Mag. 13.1), as this comet. The observations indicate the time of perihelion 1925 Nov. 2.6, six days earlier than indicated by the elements of Dubiago (*A. N.* **223**, 70). Dr. A. C. D. Crommelin has calculated the following ephemeris, using Dubiago's elements with the earlier date of perihelion.

EPHEMERIS OF BROOKS' PERIODIC COMET.

[From B. A. A. Circular No. 12]

0h U. T.	R. A. h m s	Decl. ° ′	log *r*	log Δ
1925 Oct. 2	23 16 19	—4 56.7	0.278	9.965
10	23 15 39	—5 48.3	0.276	9.976
18	23 16 35	—6 25.4	0.274	9.993
26	23 19 22	—6 46.0	0.273	0.013
Nov. 3	23 24 09	—6 48.9	0.273	0.036
11	23 30 44	—6 35.4	0.273	0.060
19	23 38 58	—6 05.8	0.274	0.086
27	23 48 37	—5 22.6	0.276	0.112
Dec. 5	23 59 31	—4 27	0.278	0.138
13	0 11 28	—3 22	0.281	0.164
21	0 24 25	—2 12	0.284	0.188

The last three lines of the ephemeris are taken from Copenhagen Circular 81.

The comet was photographed by Professor Van Biesbroeck with the 24-inch reflector at the Yerkes Observatory on Sept. 28 and estimated to be of magnitude 14. The position measured upon the photograph is given in the table below.

On the night of October 15-16 the comet was observed by Wilson with the 16-inch telescope of Goodsell Observatory. The night being very transparent the comet was seen at once close to the ephemeris place. It was very faint, round, about 30″ in diameter, with a slight central condensation of about magnitude 14. The position, measured with great difficulty with the filar micrometer, is given in the table below.

The following brief finding ephemeris sent us by Professor R. G. Aitken, director of Lick Observatory, for Brooks' comet (*g*1925) has been computed by Dr. H. M. Jeffers. He adopted Dubiago's elements (*A. N.* 5332) with the exception of *T*. This was assumed to be 1925 November 2.61 Gr. C. T. to fit Albritzky's observation of September 24. Dr. Jeffers' own measure of October 10 shows that the assumption gives a satisfactory ephemeris.

1925	α 1925.0 h m	δ 1925.0 ° ′	log *r*	log Δ
Oct. 8.0	23 15.7	—5 36	0.276	9.974
12.0	15.7	—5 59		
16.0	16.1	—6 18	0.274	9.988
20.0	17.0	32		
24.0	18.5	42	0.273	0.008
28.0	20.5	48		
Nov. 1.0	22.9	50	0.273	0.029
5.0	25.7	47		
9.0	23 29.0	—6 40	0.273	0.053

Magnitude = 12 on October 10.

Correction: Sept. 24 (Albritzky) 0^m0, —1′
Oct. 10 (Jeffers) +0.1, 0

OBSERVED POSITIONS OF BROOKS' PERIODIC COMET.

U. T.	α 1925.0	δ 1925.0	Observer	Place
	h m s	° ′ ″		
Sept. 28.3367	23 17 07.72	−4 30 12.7	Van Biesbroeck	Williams Bay
Oct. 16.1566	23 16 20.23	−6 17 38.8	Wilson	Northfield

Faye's Periodic Comet Rediscovered.—A cablegram from Copenhagen to Harvard College Observatory, October 21, announces the rediscovery of Faye's periodic comet by Baade at Bergedorf, Germany, on the morning of October 20. The position is given approximately as

U. T.	α	δ
Oct. 20.1084	$8^h\,05^m\,20^s$	$+9°\,33'$

The daily motion is given $1^m\,44^s$ east, 12′ south, and the magnitude is noted as 13. The word tail is appended to the cablegram, signifying probably that a tail is visible on the photograph in spite of the faintness of the nucleus.

The following observation has come to hand:

U. T.	α 1925.0	δ 1925.0	Observer	Place
Oct. 22.3992	$8^h\,08^m\,56^s.9$	+9° 05′ 54″	Van Biesbroeck	Williams Bay

COMMUNICATIONS.

Occultation of Delta Capricorni, Sept. 28, 1925.— The occultation was observed under almost perfect conditions as to seeing and position of the moon.

The observations were made in my observatory, Lat. 40° 51′ 50″ N, Long. 73° 59′ 19″ W, with a 4-inch telescope, and a stop watch. Rate of time piece determined by radio signals on same, and following days, at noon.

	Eastern Standard Time
Immersion	$7^h\,22^m\,23^s.8$
Emersion	8 40 35.5

As an illustration of the accuracy of predictions by the graphical method; so well described in that excellent book, "The Graphical Construction of Eclipses and Occultations," by Professor William F. Rigge, would say that the above times differed only 42 seconds and 23 seconds respectively from the times of Immersion and Emersion as determined for this place by that method.

Leonia, N. J. J. ERNEST G. YALDEN.

The Worcester Meteor Society.— It may interest you to learn that we have a Meteor Club at this old Classical High, one of the oldest preparatory schools in New England. Why did we start such an organization? Well, the facts are that our regular curriculum gives no place at all among its "required" studies for even one term of elementary Astronomy. Some of us feel that to be utterly unacquainted with the starry firmament is a serious lack. For, wherever we may go, under whatever circumstances we may have to drift from place to place, the stars are our constant companions. Scenery will change; we have to take on new ideas of beauty when we transport ourselves from one latitude to another, from one continent to another, but whether in the Orient or the Occident, by just lifting the eyes, we find ourselves at home with the stars.

Thus far we have had very excellent success for we now have about ten boys who are capable of observing and recording meteors.

Mr. Field, our president, has already observed 146 meteors, and the writer of this letter in 1924 completed a list of 1124 meteors, the latter figure being the best record for the year as reported by the various Meteor Societies in the United States.

We have not neglected to forward our report of observations to Dr. Charles P. Olivier, president of the American Meteor Society, Leander McCormick Observatory, University of Virginia. By a majority vote it was decided to call our club "The Worcester Meteor Society" after the parent organization.

Our membership is not, however, confined at all in its territorial limitation, for we have elected a member from Fort Worth, who is one of our most enthusiastic members.

The city of Worcester, as a reward for the excellent results obtained by the society with such inadequate means at hand, is equipping the club with a 3-inch telescope with eyepieces ranging from 45X to 160X. With this instrument we hope to take up observations of variable stars.

By a unanimous vote of the members, Miss Frances M. Hunt was elected as Faculty Advisor of the Worcester Meteor Society. Miss Hunt was formerly a student at Carleton College, and is greatly interested in our club, and in the subject to which it is devoted.

Our officers at the present time are as follows: President, G. Lowell Field; Vice President, Richard Morse; Secretary, Milton Sheftel; Treasurer, Felix Olson; Executive Committee, Felix Olson and Samuel Cramer.

We would be glad to hear from any other organization or persons interested in Astronomy regarding their work and their hope for future success.

SAMUEL MARSHALL CRAMER.

Worcester, Mass., October 22, 1925.

A Bright Meteor.—Sitting in a duck blind without timepiece or compass, with clouds banked across both eastern and western skies, I saw my largest meteor.

Place—five miles N. E. of Billings, Montana, time—5:25 P. M., Oct. 19, 1925. Meteor when first seen was nearly due north, a few degrees below Polaris, moving S. E. to a point a little N. of E. before disappearing behind clouds about 10 degrees above horizon. Appeared three or four times as bright as Venus. As it was still too light for stars to be visible, in the section of sky free from clouds, the observation of position in relation to Polaris was made about 6:15 P. M. from mind picture.

GEO. F. SHEA.

GENERAL NOTES

Henry C. Lord, professor of astronomy and since 1895 director of the observatory at the Ohio State University, died on September 15, at the age of fifty-nine years. (*Science*, October 2, 1925.)

American Astronomical Society.—The next meeting of the American Astronomical Society will be held at the Eastman Research Laboratory, Rochester, N. Y., on January 1 and 2, 1926.

Positions of Comets and Asteroids.—It was recommended at the meeting of the International Astronomical Union, at Cambridge, England, this summer, that all positions of comets and asteroids be given in the future as mean places referred to the equinox at the beginning of the year. POPULAR ASTRONOMY is glad to conform to this recommendation and unless otherwise specifically stated the positions published will be understood to be mean places for the beginning of the year.

Universal Time. — The agreement on the designation of the time to be used was not so unanimous. There seemed to be the feeling that the designation Greenwich Civil Time (G. C. T.) might be misinterpreted, especially in England where during five months in the year "daylight saving time" is used and is understood to be Greenwich civil time. Several European publications have adopted the designation "Universal Time" with the abbreviation U. T., meaning exactly the same as G. C. T. in the sense in which the Americans have used it, i. e., Greenwich mean time with the 0^h beginning at midnight. There would seem to be no serious objection to the world-wide adoption of "U. T." with this meaning, for the published times of comet and asteroid observations and for announcements in telegrams and circulars.

Julian Day.—It seemed best to the Union not to change the time of beginning of the Julian Day, but to continue the practice of many years standing, of reckoning the Julian Day from noon to noon. The Americans had adopted the change to midnight at the beginning of the year 1925, but there need be no resulting confusion for in all the published observations since the change the time has been designated J. C. D. instead of J. D. In the Harvard College Bulletin 824, Professor Shapley announces that the Harvard publications will return to the former practice of reckoning the Julian Day from noon to noon.

R R Vulpeculae. — In *Acta Astronomica*, Cracow, Poland, September 24, 1925, Mr. J. Gadomski calls attention to the fact that the minima of RR Vulpeculae are now occurring about 19 hours earlier than predicted by the old elements. He would make the period $5^d.05026 \pm 0.00003$. A minimum was observed on August 26 at $1^h.6$ Universal Time.

Astronomical Lectures at Harvard.—The following copy of a notice for the *Harvard Gazette* shows that Harvard College Observatory is doing its share toward making astronomy interesting to the public.

The Harvard College Observatory will be open to visitors from 7:30 P. M. to 9:00 P. M. on the dates given below. A short non-technical talk will be preceded, when the weather permits, by telescopic observation of celestial objects. Exhibits showing the work of the Observatory will be explained by members of the staff.

Tickets for the open nights must be obtained in advance. There is no charge for admission. Applicants will be assigned tickets for one night only.

The dates, titles of lectures, and the speakers are as follows: Friday, Oct. 16, "The Milky Way," Professor Bailey; Monday, Oct. 26, "The Major Planets," Professor L. A. Brigham of Boston University; Thursday, Nov. 12, "Stellar Evolution," Dr. Payne; Tuesday, Nov. 24, "The Star Clouds of Magellan," Professor Shapley; Wednesday, Dec. 9, "Variable Stars," Professor S. D. Townley of Stanford University.

Integrated Magnitude of 47 Tucanae.—The following communication has been received from Mrs. Paraskévopoulos at Arequipa, under date of August 14, 1925.

On a plate taken with a one-inch lens of one-inch focal length, attached as a miniature telescope to our 3-inch Ross Tessar mounting, the bright cluster 47 Tucanae, photographed in focus, appears as a fine starlike image. In the same field I have identified the following stars:

	R. A. 1900	Dec. 1900	Spectrum	Photographic Magnitude
	h m	° ′		
δ Tucanae	0 29.2	—71 49	A5	6.3
π Tucanae	0 16	—70 11	B9	5.4

The magnitudes used are those given in the Henry Draper Catalogue.

By comparison with these two stars I have provisionally estimated the integrated apparent photographic magnitude of the cluster as 4.4.

The apparatus is being used by Dr. Paraskévopoulos in an attempt to determine the integrated magnitude of the Magellanic Clouds.

Harvard College Observatory Bulletin 824.

Cambridge, Massachusetts, September 30, 1925.

The Companion of Sirius.—This faint star has continued to keep the attention of the astronomical world fixed upon it to a much greater degree than the brilliant dog star itself. The irregularities in the motion of the primary led Bessel many years ago to predict its existence. In 1862 it was discovered visually by Alvan G. Clark while he was helping his father test the 18-inch lens now at the Dearborn Observatory of Northwestern University. The magnitude of the companion is about 8.5 while that of the primary is —1.6. This difference of ten magnitudes represents a ratio of 1 : 10000 in brightness. After it had been observed for some years it became possible to calculate an orbit which had a period of 50 years and which showed that the companion had a mass equal to that of the sun, which is about one-half that of Sirius. The large mass and low luminosity showed clearly that the companion was an exceptional star.

In 1914 Adams of the Mt. Wilson Observatory announced that he had succeeded in photographing the spectrum of the companion with the 60-inch reflector. The spectrum is classed as F0 or possibly a late A-type. The effective temperature of such a star is approximately 8000°, about 2000° higher than the temperature of the sun. The brightness per unit of surface being higher than that of the sun there seems only one simple explanation for the small amount of light produced, namely, a very small radiating surface. A small surface in turn means small volume and hence extremely high density. On the basis of a paper published by Seares in 1922 the radius of the companion would be 24,000 km if the spectral type is F0, and only 18000 km if the type is A5. The densities corresponding to these values of the radius would have the extraordinary values of 30,000 and 64,000, respectively, times that of water.

Einstein had predicted on the basis of his generalized theory of relativity that a radiating atom in a strong gravitational field would have its vibrations retarded, and hence the wave-length of its spectral lines increased. In 1924 Eddington calculated the strength of the gravitational field at the surface of the companion of Sirius, assuming a spectral type of F0, an effective surface temperature of 8000°, a density of 53,000 and a radius of 19,600 km. On this basis he found there should be a relativity shift of the spectral lines corresponding to 20 km per second. In the mean time Adams had secured additional spectrograms with the 100-inch re-

flector which were measured with care in a variety of ways. After applying the corrections due to the radial velocity of Sirius and the relative velocity of the companion with respect to the primary, as determined from the orbit, he finds a shift corresponding to 23 km per second which cannot otherwise be accounted for than as a relativity displacement. The agreement in the amount of this shift between Eddington's prediction and Adams' observation is remarkably close considering the difficulties of the problem.

Taking Eddington's value of the radius and the mass of the companion as equal to that of the sun, the value of gravity at the surface of the companion is about 35,000 times that at the surface of the earth. Eddington's explanation for such an extraordinary concentration of matter is that the atoms have been stripped of most of their electrons and thus the density approaches that of the atomic nuclei. Further information concerning this remarkable star will be awaited with the greatest interest.

Motions Prove Stars at Vast Distances. — Confirmation of estimates made by Dr. Harlow Shapley, director of the Harvard College Observatory, of the distance of globular star clusters are contained in a series of measurements recently completed by Dr. Adriaan van Maanen, astronomer at the Mt. Wilson Observatory. Dr. Shapley's figures, which placed some of these objects so far away that their light takes a hundred thousand years or more to reach us, though travelling at a speed sufficient to encircle the earth seven times in a second, was based on the variation in light of certain stars known as Cepheid variables.

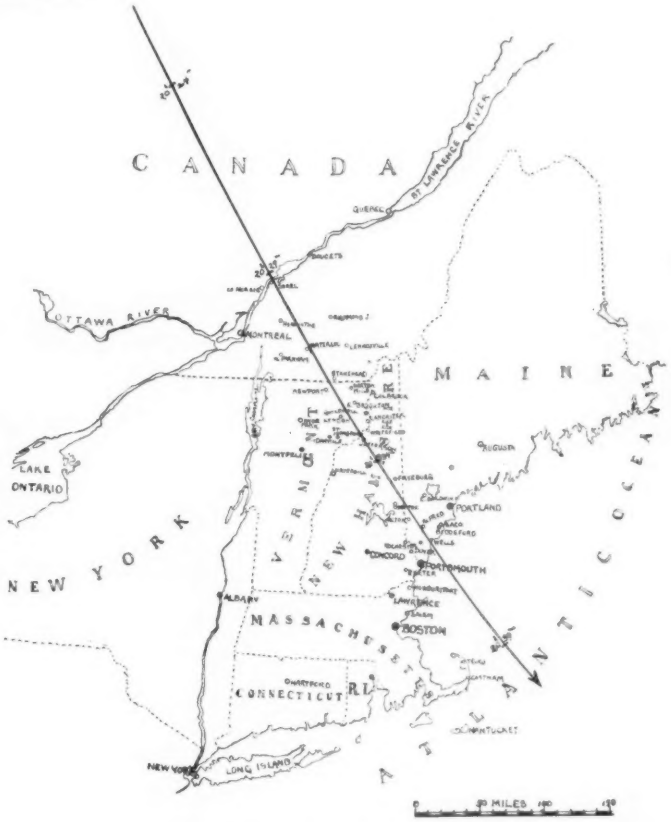
These stars undergo a periodic increase and decrease in their magnitude, the length of the period varies according to the average brightness, and so by watching them for a while, the astronomer can determine how bright they really are. The more distant the star is, the fainter it seems, and so the relation between the actual and the apparent brightness permits an estimate of the distance.

Criticisms of this method have been expressed, but Dr. van Maanen has compared photographs made of one of these clusters, in the constellation of Hercules, taken eleven years apart with the great 60-inch telescope at Mt. Wilson, to determine the motions of its stars. They are undoubtedly moving and many at high speeds, but Dr. van Maanen's results revealed practically no motion, and he concludes that this is due to the fact that they are so far away that a much longer time would be required for the movements to become apparent. "This is a beautiful confirmation of Dr. Shapley's distance," he says, "because with the distance derived by him, even a fairly high speed would still give an extremely small motion on the plates."

Dr. van Maanen also says that his work confirms the motion which he has found by a similar method for the spiral nebulae, cloud-like objects with spiral arms, and which some other astronomers have suggested might be due to some error. (*Science Service*, Oct. 17, 1925.)

Path of Totality of the Solar Eclipse of August 31, 1932.— On February 17, 1925, Mr. F. E. Seagrave wrote us calling attention to the probability that the path of totality of the solar eclipse of August 31, 1932, as plotted by Oppolzer in his *Canon der Finsternisse* is in error, and that the center line instead of missing the United States altogether will probably cross Maine not far from the city of Portland. He asked us to verify his computations. Later, April 9, he sent revised calculations with the same request. It was not until September that we were able to comply with his request.

Using Newcomb's tables in *Astronomical Papers of the American Ephemeris and Nautical Almanac*, Vol. I, we obtain a center line for the path of totality in close agreement with that found by Mr. Seagrave. The results are, however, subject to the errors of Newcomb's tables and must be revised by the use of more modern data.



Center Line of the Total Solar Eclipse of August 31, 1932.

The following table gives the results of Mr. Seagrave's computations, λ being the longitude and ϕ the latitude of points on the center line of the path of totality. The accompanying chart shows that part of the center line crossing Canada, Vermont, New Hampshire and Maine. It will be seen that a number of cities in the states mentioned will be near the center line and that Portsmouth, N. H., and Portland, Maine, will lie close to, if not within, the shadow path. The line passes over the White Mountains, where people at summer camps may have a splendid opportunity to witness the eclipse. The partial eclipse will be very large over all of New England.

COÖRDINATES OF POINTS ON CENTER LINE OF TOTAL ECLIPSE.

Greenwich Civil Time		Longitude		Latitude	
h	m	°	′	°	′
19	19	+116	43	+81	04
19	24	105	07	+77	22
19	29	98	50	+74	03
19	34	94	36	+71	03
19	39	91	25	+68	17
19	44	88	51	+65	41
19	49	86	39	+63	13
19	54	84	43	+60	53
19	59	82	56	+58	37
20	04	81	16	+56	26
20	09	79	40	+54	18
20	14	78	05	+52	14
20	19	76	30	+50	11
20	24	74	53	+48	10
20	29	73	11	+46	10
20	34	71	23	+44	11
20	39	69	25	+42	12
20	44	67	13	+40	12
20	49	64	41	+38	10
20	54	61	36	+36	04
20	59	57	34	+33	50
21	04	+49	01	+30	35

Note on the Proper Motion of the Planetary Nebula N. G. C. 6572.—The parallax of N. G. C. 6572 was measured by van Maanen (Mt. W. Contr. 237, 1922) and found to be $+0''.003 \pm 0''.014$ (m. e.); and a value of $-0''.055 \pm 0''.009$ was found for the proper motion in right ascension. (In Table I of the same paper μ_α is given as $+0''.003 \pm 0''.014$, but this is apparently a misprint.)

In view of the considerable difference between van Maanen's proper motions of planetaries and those determined by Wirtz (A. N., **203**, 298, 1916), proper motions for four of these objects were redetermined at Mount Wilson by van Maanen and Mrs. Marsh (Pub. A. S. P., **35**, 261, 1923). For N. G. C. 6572, they then found $\mu_\alpha = -0''.071$, $\mu_\delta = +0''.040$; whereas Wirtz had derived the values of $+0''.003$ and $-0''.004$, respectively.

At the request of Dr. Lundmark this planetary nebula was measured on two Harvard plates of the I series (scale value, $1° = 20$ mm.) taken in 1893 and 1924, respectively. The scale of the plates is twenty-two times smaller than van Maanen's; the difference in epoch, however, is eight times greater for the Harvard plates, while in addition to this, the Harvard plates have the advantage that the small scale makes the nebula indistinguishable from a star.

The result of measurement and computation is

$$\mu_\alpha = +0''.006 \pm 0''.020, \qquad \mu_\delta = -0''.017 \pm 0''.020$$

from which we conclude that the proper motion is insensible. (W. J. L.)

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